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THE *DIFFICILIS* COMPLEX OF *SPHAERODACTYLUS* (SAURIA, GEKKONIDAE) OF HISPANIOLA

PART 1. *SPHAERODACTYLUS DIFFICILIS, S. CLENCHI,* AND *S. LAZELLI*

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PART 2. *SPHAERODACTYLUS SAVAGEI, S. COCHRANAE, S. DARLINGTONI, S. ARMSTRONGI, S. STREPTOPHORUS,* AND CONCLUSIONS

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ALBERT SCHWARTZ

ABSTRACT

Three Hispaniolan species of *Sphaerodactylus* of the *difficilis* complex are discussed in detail. *Sphaerodactylus difficilis* is shown to be composed of seven subspecies, and *S. clenchi* of two. Of these two species, *S. difficilis* is widely distributed in the República Dominicana but is restricted to northern Haiti and one locality in central Haiti, whereas *S. clenchi* occurs only in the extreme northeastern República Dominicana. The holotype of *S. lazelli* from northern Haiti is still the only known specimen. Aside from meristic data, information on ecology, altitudinal distribution, and sympatry-allopatry are also given.

INTRODUCTION

Throughout the Bahama Islands (including the Turks Bank), Cuba, Isla de la Juventud, Puerto Rico and its associated offshore islands (and including Isla Mona, Isla Monito, and Isla Desecheo), the Virgin Islands, and the northern Lesser Antilles, occurs a group of moderately large geckos of the genus *Sphaerodactylus* which characteristically have a prominent dark scapular pateh or blotch with an associated pair of ocelli. This group of forms has its greatest diversity in part on Puerto Rico (where all species are members of this assemblage; Thomas and Schwartz, 1966*a*) and in part on the centrally located island of Hispaniola. Shreve (1968) appropriately used the trinomial name of the first-described member (*S. notatus* Baird) to refer to this group of lizards.

There have been known only two Cuban (and Isla de la Juventud) species of the group—*S. notatus* and *S. bromeliarum* Peters and Schwartz. *Sphaerodactylus notatus* itself occurs as well on the Great and Little Bahama banks, on the North American mainland in southeastern Florida, along the Florida Keys, and on the Swan Islands (Schwartz, 1966). The southern Bahamas (Great and Little Inagua) and the Turks Islands have the related *S. inaguae* Noble and Klingel and *S. underwoodi* Schwartz. In Puerto Rico and the Virgin Islands (as well as the Lesser Antilles as far south as St. Barthélémy) occur seven species of this group—*S. macrolepis* Günther, *S. roosevelti* Grant, *S. klauberi* Grant, *S. gaigeae* Grant, *S. nicholsi* Grant, *S. parthenopion* Thomas, *S. beattyi* Grant. Other forms are *S. levinsi* Heatwole from Isla Desecheo, *S. monensis* Meerwarth from Isla Mona, and *S. micropithecus* Schwartz from Isla Monito. From this brief geographical review, it is apparent that the *notatus* group is widely distributed throughout the Greater Antilles.

On Hispaniola, the *notatus* group has achieved a diversification greater than it has on Puerto Rico. We are certain that the roster of the Hispaniolan species is as yet incomplete. Barbour (1914:265) named *S. difficilis* as the first Hispaniolan member of the group; the description of this species was based on four specimens from the República Dominicana (two from La Vega, two from Puerto Plata); even in this short series, Barbour noted that there were several variable characters, and he was uncertain that all four specimens represented the same species. Noble and Hassler (1933) named *S. armstrongi* on the basis of two specimens from near Paraíso in the Sierra de Baoruco, República Dominicana, on the Península de Barahona, and *S. altavelensis* from Isla Alto Velo south of Isla Beata which is in turn off the southernmost point of this same peninsula. From the southern shore of the Bahía de Samaná, Ruibal (1946) named *S. cochranae* on the basis of two specimens. Most of these species were considered members of the *difficilis* complex on Hispaniola by Shreve (1968).

The greatest step forward in our knowledge of Hispaniolan *difficilis* complex members is the review by Shreve (1968). Impressed with the differences in accumulated specimens at the Museum of Comparative Zoology at Harvard University, Shreve undertook a review of the complex on Hispaniola. He examined 295 specimens from both Haiti and the República Dominicana, and named *randi, savagei,* and *juanilloensis* as subspecies of *S. notatus* (with which Shreve considered *S. difficilis* conspecific; *difficilis* was regarded as a recognizable subspecies of *S. notatus*); *S. lazelli* from Cap-Haïtien in northern Haiti, based on a single specimen; *S. darlingtoni* from Pico Diego de Ocampo, República Dominicana, from two specimens; *S. noblei* from

Los Bracitos, República Dominicana, with a distribution on the Península de Samaná, the eastern Cordillera Septentrional, and the southern shore of the Bahía de Samaná; *S. clenchi* from the Península de Samaná; and *S. brevirostratus* as an abundant and widely distributed species in both Haiti and the República Dominicana. Shreve (1968) recognized two subspecies of *S. brevirostratus* (*b. brevirostratus* and *b. enriquilloensis*).

My own interest, along with that of Richard Thomas, in this group of Hispaniolan sphaerodactyls began with a visit to Haiti in 1962. Since that time, both of us have spent considerable time between 1963 and 1979 collecting in Haiti and the República Dominicana. The result of these expeditions is that we have good representations of these geckos from throughout much of Hispaniola, and certainly a far better coverage than did Shreve. We have examined over 3,000 specimens, most of which we have ourselves collected. In two papers (Schwartz and Thomas, 1977; Thomas and Schwartz, 1977) we have named five new species of the *difficilis* complex (*S. ocoae, S. zygaena, S. streptophorus, S. cryphius, S. nycteropus*). Schwartz (1977) reviewed the status of *S. randi,* regarding it as a species distinct from *S. difficilis* and naming two new subspecies, *methorius* and *strahmi.* We also now have in press (Thomas and Schwartz, manuscript) a paper clarifying the relationships of *S. brevirostratus* and *S. altavelensis* and naming a new species from northwestern Haiti.

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METHODS

I have taken the measurements and counts used by myself and Thomas previously in our studies of Antillean geckos (that is, Thomas and Schwartz, 1966*a*, on Puerto Rican *Sphaerodactylus*). These data include: 1) measurement of snout–vent length in millimeters; 2) dorsal scales between axilla and groin; 3) ventral scales between axilla and groin; 4) scales around body at midbody; 5) number of supralabials on both sides to below center of eye; 6) number of internasal scales; 7) number of fourth toe lamellae; 8) the presence of, and amount of, keeling on the gular, chest, and abdominal scales; and 9) the length and width (=lateral extent) of the escutcheon in males. Counts of dorsal, ventral, and midbody scales, supralabials, and fourth toe scales were taken on specimens with snout–vent lengths above 25 mm in larger taxa. The number of internasals and the extent of ventral keeling were determined on many specimens regardless of size. Excessively low counts of fourth toe lamellae are usually due to the fact that this count was begun distad to the small plantar scales, with the first scale that was transversely entire; in many specimens with very low lamellar counts, this is due to the presence of one or more basal digital scales that are longitudinally divided and thus not included in the lamellar count. Likewise, abnormally low counts of length or breadth of escutcheon are due to lack of complete development of this group of specialized ventral scales in males. However, mean and modal differences in lamellar counts are of little importance in this complex, and the species differences (where they exist) in escutcheon size are so obvious that they are not obscured by the abnormally low counts in some specimens.

In the taxonomic treatment I have followed a temporarily conservative course regarding the status of "*S. difficilis.*" Rather than regarding this taxon as a subspecies of *S. notatus,* I consider it a species distinct from that form. Clarification of the status of these

two species will be attempted in a later paper. The present paper discusses the variation and systematics of three species—*S. difficilis, S. clenchi,* and *S. lazelli.*

I have not here, nor will we later, include a discussion of *S. samanensis* Cochran or *S. callocricus* Schwartz as part of this complex, because they are so set apart in morphology and color pattern that I doubt their close relationship with the geckos discussed here. *S. samanensis* was included in the *difficilis* group by Shreve (1968) and *S. callocricus* was described subsequently. In *S. samanensis* the dorsal body scales are very strongly keeled and weakly imbricate; the snout is narrow and pointed; the color pattern is boldly cross-banded on the body; and the head pattern is also banded in part but is not easily associated with any of the *difficilis* complex head patterns. In fact, the pattern, particularly that of the head, is interestingly similar to that of *Sphaerodactylus cinereus* Wagler (see Graham and Schwartz, 1978, for usage) from Hispaniola and Cuba, a form that Thomas and Schwartz (1966*b*), with some reservation, included in the *S. nigropunctatus* (=*S. decoratus*) complex. I am not adamant about their lack of affinities with the *difficilis* group; I only assert that *samanensis* and *callocricus* are peripheral to the forms discussed herein and elsewhere in this series of papers. Perhaps when their variation in color pattern is more completely known, we will have better insight into their relationships.

SYSTEMATIC ACCOUNTS

Sphaerodactylus difficilis Barbour

Sphaerodactylus difficilis Barbour, 1914, Mem. Mus. Comp. Zool., 44:265.

Definition.—A species of *Sphaerodactylus* with large, acute, strongly keeled, flattened, imbricate dorsal scales, axilla to groin 22 to 40; no area of middorsal granules or granular scales; dorsal body scales with four to seven hair-bearing organs, each with a single hair, around apex. Dorsal scales of tail keeled, acute, imbricate, and flat-lying; ventral scales of tail smooth, rounded, enlarged (often only slightly) midventrally; gular scales usually smooth, but occasionally weakly to strongly keeled; chest scales smooth; ventral scales rounded, imbricate, axilla to groin 23 to 37, smooth; scales around midbody 37 to 60; internasals 0 to 3 (mode 1); upper labials to mid-eye 3 (rarely 4); escutcheon with a broad and compact central area and extensions onto thighs to near underside of knee (3–8 by 8–30).

Color pattern sexually dichromatic and variable among the subspecies. Adult males dorsally pinkish gray or gray to tan or brown, usually with scattered dark brown scales giving a coarsely salt-and-pepper effect, trilineate head pattern obsolescent or (usually) absent, the head (and chin and throat) often covered by small to large dark brown to black dots, the throats with yellow to orange ground color; dark scapular patch usually absent, and if present, usually very restricted and diffusely edged; a pair of small pale ocelli present or absent (by population); venter variable, from gray to flesh. Females with same dorsal pattern as males, although distinctly lineate in some populations, but head with a prominent trilineate pattern, and pattern brown on a buffy to tan ground color, and head scales dotted; scapular patch variable (by population) from relatively large, brown to black, with an associated pair of pale (white to buffy or gray) ocelli, to small with a single included ocellus, or both patch and ocelli entirely absent; ventral color as in males. Iris color yellow, tan, or brown. Juveniles with a more intense female pattern.

Distribution.—In Haiti, from the Presqu'île du Nord Ouest (Bombardopolis, Môle St. Nicholas) east along the northern Haitian coast to Terrier Rouge and inland as far as Grande Rivière du Nord, Dondon, Ennery, and Terre Sonnain near Gonaïves. In the República Dominicana, from Monte Cristi in the northwest, east to the base of the Península de Samaná (Sánchez); central and eastern portions of the República Dominicana (Santiago and La Vega provinces east to central La Altagracia Province, but absent from most coastal regions in La Altagracia Province), thence westward both along the southern coast and inland to San Juan and Azua provinces, and along the eastern coast of the Península de Barahona to Enriquillo and into the uplands of the Sierra de Baoruco (La Lanza). A single record from Hinche, Département de l'Artibonite, in central Haiti; Cayos Siete Hermanos (Muertos, Monte Chico, Monte Grande) off the northern Dominican coast, and Isla Pascal in the Bahía de Samaná (Shreve, 1968:14); Ile de la Tortue. Altitudinal distribution from sea level to 2,000 ft (610 m) on the northern slopes of the Cordillera Central between La Vega and Jarabacoa, and on the southern slopes of the Cordillera Septentrional in the vicinity of La Cumbre, and to 2,400 ft (732 m) in the Sierra de Baoruco (Fig. 1).

Sphaerodactylus difficilis difficilis Barbour

Sphaerodactylus difficilis Barbour, 1914, Mem. Mus. Comp. Zool., 44(2):265.

Type-locality.—Santiago de la Vega, La Vega Province, República Dominicana.

Holotype.—MCZ 7834.

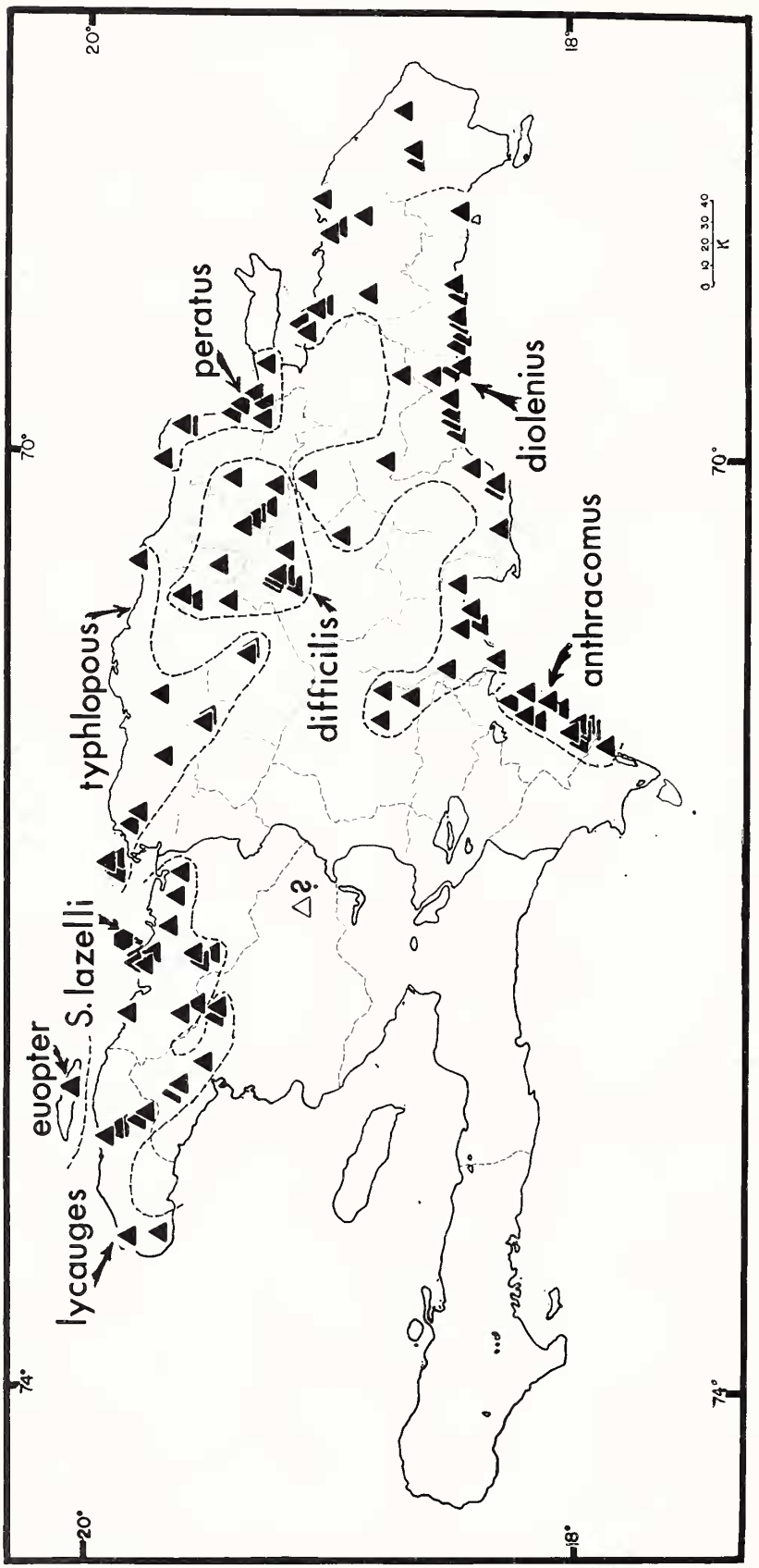

Fig. 1.—Map of Hispaniola, showing distributions of *Sphaerodactylus difficilis* (triangles) and *S. lazelli* (hexagon). Subspecies of *S. difficilis* are named on the map.

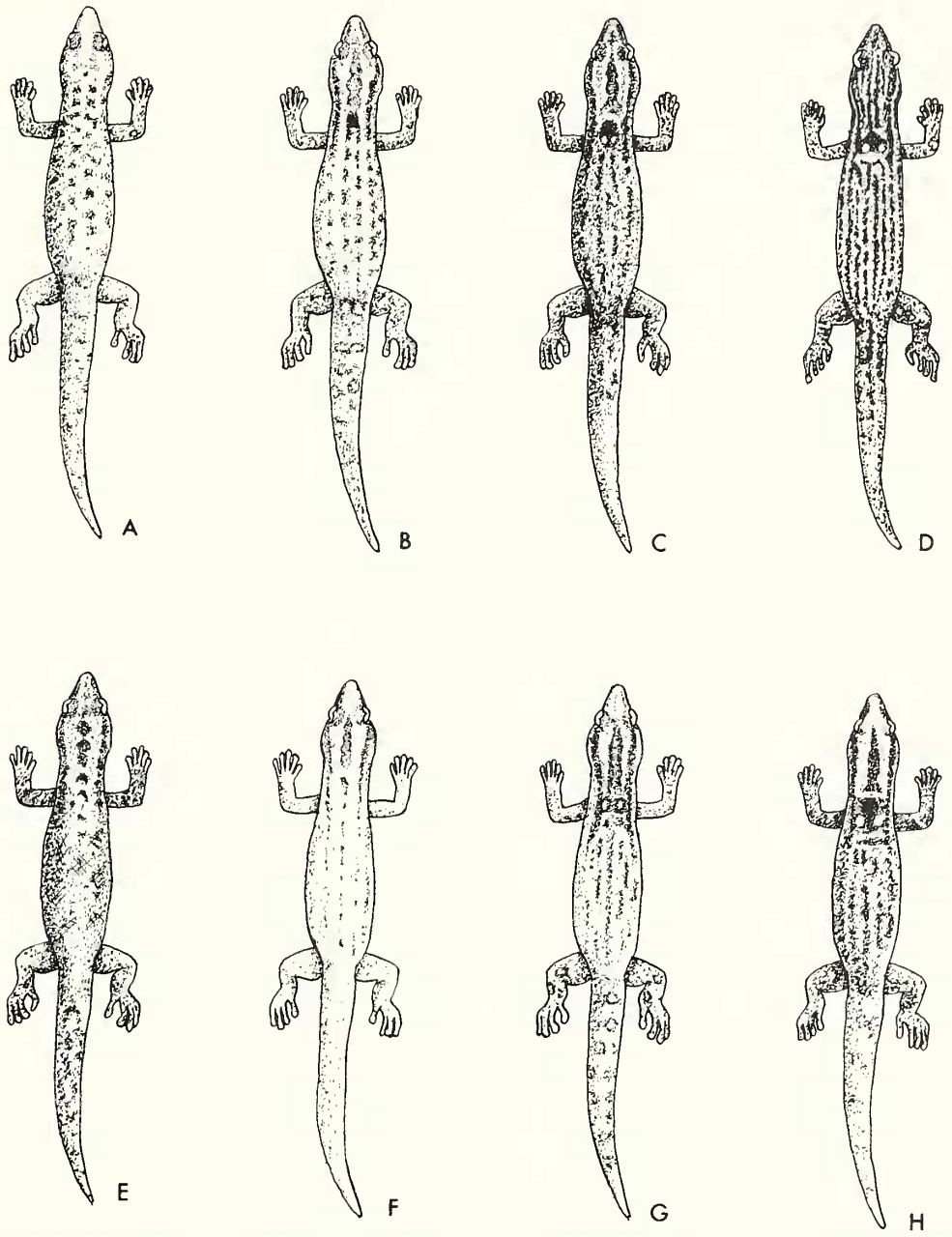

Fig. 2.—Dorsal views of the subspecies of *Sphaerodactylus difficilis*, as follow: A) *difficilis* (male, ASFS V14170); B) *difficilis* (female, ASFS V1788); C) *lycauges* (holotype female, CM 52251); D) *euopter* (holotype female, CM 54142); E) *typhlopous* (holotype female, USNM 166966); F) *peratus* (holotype female, CM 52264); G) *diolenius* (holotype female, USNM 166967); H) *anthracomus* (holotype female, CM 52279).

Definition.—A subspecies of *S. difficilis* characterized by a combination of high number of dorsal scales (25–34) between axilla and groin, moderate number (42–55) of midbody scales, female shoulder pattern consisting of a small indistinct dark scapular spot and a single median pale ocellus, and males without patch or ocellus (Figs. 2A and 2B).

Distribution.—República Dominicana, from the type-locality south onto the northern slopes of the Cordillera Central (between La Vega and Jarabacoa), west to near Santiago, north onto the southern slopes of the Cordillera Septentrional as far as the pass across these mountains at La Cumbre, and east to Los Bracitos, in La Vega, Santiago, Espaillat,

Duarte (and presumably Salcedo), and extreme southern Puerto Plata provinces.

Variation.—The series of 65 *S. d. difficilis* has the following counts and measurements (means in parentheses): largest male (ASFS V18180) 34 mm snout–vent length, largest female (ASFS V18197) 33 mm; dorsal scales between axilla and groin 25–34 (29.2); ventral seales between axilla and groin 24–37 (30.2); midbody scales 42–55 (48.1); supralabials to mid-eye 3/3 (50 individuals), 4/4 (1); internasals 0 (7 individuals), 1 (50), 2 (8); fourth toe lamellae 9–13 (11.0; mode 10); gular scales usually smooth (35 individuals) but at times keeled (19) or partially keeled (11); escutcheon 4–6 (5.4) by 12–27 (21.9).

Males are grayish pink to brown above, regularly heavily flecked with darker brown to give a salt-and-pepper effect. The heads are dull yellow, and the throats are yellow to orange, often heavily dotted or almost marbled with dark brown. The upper surface of the head may be either plain or rather heavily covered by brown dots or spots, these dots arranged in a more or less lineate pattern following the arrangement of the dark head stripes of the females. The scapular patch is almost always absent but is barely discernible in young males (snout–vent length 28 mm: ASFS V18185) which still retain remnants of the juvenile (=female) pattern; an ocellus, prominent in females, is absent in males.

Females are colored dorsally like males and are likewise salt-and-pepper in aspect, except that there is a tendency for the dorsal flecking to be arranged in longitudinal lines, giving a vaguely lineate aspect. The head pattern is trilineate, with a single median dark brown line from the snout onto the shoulders (where it becomes darker brown to black and forms the restricted scapular patch) and a pair of lines from the snout across the lores and through the eyes onto the shoulders, where they fade and become lost in the dorsal body pattern. There is regularly also a moderately sharp ventrolateral (postauricular) line from the ear opening along the neck and above the forelimb insertion, but this line is less sharply defined than the primary head lines noted above. The scapular patch is small and restricted, usually dark brown to black, and contains a single median pale ocellus which varies from white to pale gray or buffy. The scapular patch is at times diffuse (ASFS V16103) and in some females it is only barely indicated (ASFS V18197). The throat in females is usually immaculate, but there may be a few tiny scattered brown flecks or even some more or less diagonally oriented dark gray to brownish lines on the sides of the throat. The ventral color in both sexes is gray, flesh, or yellow-flesh.

Juveniles resemble females in pattern and color details, except that the juvenile pattern is more intense than is that of the females.

The iris color appears to be quite variable. It was recorded as golden in the series from 4 km NW La Vega, tan to grayish at 4 km N La Vega, and brown at 14.4 km E La Vega.

Mertens (1939:42–43) reported a female from Jarabacoa and two males, two females and six subadults and juveniles from Moca. Females in the latter series had "einem einzigen weissen Fleck in der Mitte" of the scapular patch, whereas the female from Jarabacoa apparently lacked any shoulder markings. Presumably this latter female represents a member of that sex where the scapular patch and ocellus were extremely reduced.

The series from Los Bracitos, Duarte Province, is assigned to *S. d. difficilis* on the basis of female and juvenile patterns. These old specimens are presently somewhat discolored and have been dissected ventrally, so that reliable ventral and midbody counts are presently impossible. Counts from this series have not been included in the computations.

Remarks.—The holotype of *S. d. difficilis* (MCZ 7834) is an adult male with a snout–vent length of about 28 mm. The specimen is much shriveled, and consequently taking scale counts is difficult and subject to inaccuracies. However, the dorsal scales between axilla and groin number about 27, and midbody scales about 45; there are 3/3 supralabials to the eye center, 1 internasal, and 11 fourth toe lamellae. The escutcheon is 6 scales long. All these counts fall within the parameters of the population herein regarded as *S. d. difficilis.* Although the specimen is now patternless, Barbour (1914:266) described the specimen as "light gray-brown, with many darker spots scattered irregularly over the whole dorsal area; some cover a single scale; others are composed of several dark seales juxtaposed." This pattern style, along with the smooth gular and chest scales, occurs in males of many populations of *S. difficilis,* including the nominate subspecies. The three paratypes (MCZ 7835, from the type-locality; MCZ 5444—two specimens—from Puerto Plata; Barbour, 1921:274) cannot now be located in the Harvard collections. The former is *S. d. difficilis*; the latter two presumably pertain to the northern Dominican subspecies.

S. d. difficilis is common in the region about the type-locality. We have taken specimens in shaded and moist cacao groves, running freely in the late

afternoon in the deep ground litter of cacao leaves, as well as in palm frond trash piles associated with cacao groves. Two geckos from east of Santiago were taken from under dead agave plants in xeric scrub, whereas the lizard from north of La Cumbre was taken from the thatch roof of the kitchen of an occupied native hut, and two other specimens were collected on the porch of a hotel between Jarabacoa and La Vega. *S. d. difficilis* is ecologically tolerant of both xeric and mesic situations and of both edificarian and natural situations as well. The distribution of the subspecies ranges from about 300 ft (10 m) at the type-locality to 2,000 ft (610 m) in both the Cordillera Central and Cordillera Septentrional. The elevation at Los Bracitos may be even higher.

S. d. difficilis occurs sympatrically with *S. darlingtoni* (Tenares, Cruce de Pimentel) in the eastern portion of the Valle de Cibao and probably elsewhere. The scale counts of these two species are quite comparable but *S. darlingtoni* in the area of sympatry is a much smaller lizard (maximally sized males and females with respective snout–vent lengths of 25 mm and 27 mm, in contrast to 34 mm and 33 mm in *S. d. difficilis*). In addition, *S. darlingtoni* is patterned quite differently than *S. d. difficilis* and is very dark (brown) dorsally.

Specimens examined.—REPÚBLICA DOMINICANA: *Santiago Province,* 7 km E Santiago (ASFS V2929–30); 4 km S La Cumbre, 1,700 ft (519 m) (ASFS V18093–97, V18175-206). *Puerto Plata Province,* 1 km N La Cumbre, 2,000 ft (610 m) (ASFS V18101). *La Vega Province,* La Vega (MCZ 7834—holotype); 4 km NW La Vega (ASFS V1786–91); 3 km NW La Vega (ASFS V1783–85); 2 km NW La Vega (ASFS V16103, ASFS V16111); 4 km N La Vega (ASFS V4179–81); 2 km S La Vega (ASFS V4166–67); 14.4 km E La Vega (ASFS V4213); 12 km NE Jarabaeoa, 2,000 ft (610 m) (ASFS V18389, ASFS V18433). *Espaillat Province,* 8 km N Moca (ASFS V4331). *Duarte Province,* 5 km NW San Francisco de Macorís (ASFS V14169); 4 km NW San Francisco de Macorís (ASFS V14170); 3 km S San Francisco de Macorís (ASFS V2960); Los Bracitos (AMNH 45201–02, AMNH 45204, AMNH 45206–07, AMNH 45209–12, AMNH 45214–15, AMNH 45217–20); 7.5 mi (12.0 km) NW Cruce de Pimentel, 400 ft (122 m) (ASFS V33480); 6.4 mi (10.2 km) SE Tenares (ASFS V33494–98, ASFS V33539–44).

Sphaerodactylus difficilis lycauges, new subspecies

Holotype.—CM 52251, an adult female, from Cap-Haïtien, Département du Nord, Haiti, one of a series collected by natives for Richard Thomas on 7–8 April 1966. Original number ASFS V10128.

Paratypes.—LSUMZ 21903–07, LSUMZ 21909–14, MCZ 119359–66, CM 52252–59, same data as holotype; USNM 167258, same locality as holotype, E. Cyphale, 6 April 1966; USNM 167259–65, ASFS V10063–88, same locality as holotype, natives, 7 April 1966; ASFS V10231–34, USNM 167266–72, same locality as holotype, natives, 9 April 1966; MCZ 63179–214, Bombardopolis, Dépt. du Nord Ouest, Haiti, A. S. Rand and J. D. Lazell, 22 July 1960; MCZ 63219–21, Port-de-Paix, Dépt. du Nord Ouest, Haiti, A. S. Rand and J. D. Lazell, 16 July 1960; ASFS V10235, Anse de la Rivière Salée, 10 km (airline) NW Port Margot, Dépt. du Nord, Haiti, E. Cyphale, 10 April 1966; MCZ 9365–66, Grande Rivière du Nord, Dépt. du Nord, Haiti, W. M. Mann, 1912; ASFS V10026, 6 km (est.) SW Limonade, Dépt. du Nord, Haiti, E. Cyphale, 5 April 1966; ASFS V10167, 1 mi (1.6 km) E Terrier Rouge, Dépt. du Nord, Haiti, R. Thomas, 8 April 1966.

Associated specimens.—HAITI: *Dépt. du Nord Ouest,* Môle St. Nicholas (ASFS V49584-85); Balladé, 5.5 mi (8.8 km) S Port-de-Paix, 100 ft (31 m) (ASFS V49902–48); 5.3 mi (8.5 km) SE Port-de-Paix (ASFS V46974–79); 0.8 mi (1.3 km) NW Balladé (ASFS V47070–77); Balladé, 12.3 mi (19.7 km) NW Bassin Bleu (ASFS V46954–81, ASFS V46989–7000); Deux Garçons, 7.7 mi (12.3 km) NW Bassin Bleu, 200 ft (61 m) (ASFS V46949–53); 1.1 mi (1.8 km) SE Bassin Bleu, 400 ft (122 m) (ASFS V46948). *Dépt. du Nord,* 1 mi (1.6 km) E Cormier Plage (ASFS V47424, ASFS V47427); Plage Rival, just N Cap-Haïtien (ASFS V39273); Carrefour La Mort (ASFS V50263–64, ASFS V50283–87); 2.2 mi (3.5 km) S Plaisance, 1,100 ft (336 m) (ASFS V40172–76, ASFS V45913–15, ASFS V50280); 2.3 mi (3.7 km) S Plaisance, 1,100 ft (336 m) (ASFS V40347); 0.2 mi (0.3 km) W Gaubert, 850 ft (259 m) (ASFS V47431–33, ASFS V47458–93); 1.2 mi (2.1 km) NE Dondon, 1,400 ft (427 m) (ASFS V38604–06); Bois Neuf, 4.5–5.4 mi (7.2–8.6 km) SE Dondon, 1,300 ft (397 m) (ASFS V47844, ASFS V47852–56, ASFS V47941, ASFS V48298–486); 8.2 mi (13.1 km) E Terrier Rouge (ASFS V39025). *Dépt. de l'Artibonite,* Ennery, 1,000 ft (305 m) (ASFS V40152–61, ASFS V40313–21, ASFS V45848–50, ASFS V45919–29, ASFS V47721–47, ASFS V47804–21); 1.2 mi (1.9 km) W Ennery, 1,100 ft (336 m) (ASFS V40186–210, ASFS V40330, ASFS V44900–27, ASFS V45918, ASFS V47698–718, ASFS V47748–96, ASFS V50140); Terre Sonnain, 1 mi (1.6 km) N Les Poteaux, 400 ft (122 m) (ASFS V40241–42, ASFS V40300–01, ASFS V46405–07); 11 mi (17.6 km) N Carrefour Joffre, 600 ft (183 m) (ASFS V40419, ASFS V40433, ASFS V44847–51); 14.5 mi (23.2 km) N Carrefour Joffre (ASFS V40427).

Definition.—A subspeeies of *S. difficilis* characterized by a combination of low number of dorsal scales (22–33) between axilla and groin, low number (37–50) of midbody scales, female shoulder pattern consisting of a relatively large and prominent dark brown to black scapular patch and a pair of pale ocelli (Fig. 2C), and males usually without both patch and ocelli, although both are at times indicated.

Distribution.—Northern Haiti, from Bombardopolis and Môle St. Nicholas on the Presqu'île du Nord Ouest in the west, east to the vicinity of Terrier Rouge (probably as far as the Rivière Massacre), and inland to the vicinities of Grand Rivière du Nord, Dondon, Limonade, Ennery and Terre Sonnain.

Description of holotype.—An adult female with a snout–vent length of 31 mm, tail length 25 mm,

distal half regenerated; dorsal scales axilla to groin 29, ventral scales axilla to groin 31, midbody scales 49, supralabials to mid-eye 3/3, 1 internasal, fourth toe lamellae 11, gular, chest, and ventral scales smooth.

Dorsal ground color dark brown, back streaked with dark brown and yellowish, with a rather definite longitudinally striped pattern; head pattern trilineate, the median line very narrow on the snout, expanding behind the eyes where it is abruptly constricted, then once more expanded and constricted to give a more or less subcircular figure, then once more expanded and leading to the scapular patch which is black and large and with a pair of cream ocelli at its posterior corners; lateral head lines across lores, through eye, and onto neck as far posteriorly as the scapular patch, where they disappear; ventrolateral lines from ear over shoulder to groin, thereby giving a lineate appearance to the lower sides; tail longitudinally marked with a diffuse series of dark longitudinal dashes; venter gray, but heavily overlaid with dark brown scale edges to give a squamate appearance; iris brown.

Variation.—One hundred nineteen *S. d. lycauges* have the following measurements and counts: largest males (ASFS V10232, ASFS V10046, MCZ 63179) 32 mm snout–vent length, largest female (MCZ 63191) 34 mm; dorsal scales between axilla and groin 22–33 (26.4); ventral scales between axilla and groin 24–35 (28.7); midbody scales 37–50 (43.4); supralabials to mid-eye 3/3 (88 individuals), 2/4 (1), ¾ (1), 4/4 (3); internasals 0 (9), 1 (94), 2 (16); fourth toe lamellae 8–13 (10.5; mode 11); gular scales usually smooth (100 individuals) but rarely keeled (4) or partially keeled (1); escutcheon 4–8 (6.1) by 10–24 (20.2).

Males are gray to gray-brown dorsally and have the back covered with widely spaced dark scales in most cases, although exceptional males lack this feature (MCZ 63179). The scapular patch and ocelli are usually lacking, but a few males (MCZ 63181, MCZ 63195) still have the ocelli vaguely indicated as a retention of a portion of the juvenile pattern. The head ground color may be faintly orange, dark yellow-gray or orange-gray, but in other (less mature?) individuals, the head is unicolor with the dorsum. The venter is yellowish brown to gray, and frequently the dark ventral scale edges give a squamate appearance to the belly. The throats are variable, from more or less immaculate but with a grayish suffusion to heavily and densely dotted with dark brown to black; the degree of throat spotting is not necessarily correlated with the amount of dorsal cephalic spotting or dotting, because some males (ASFS V10048) with heavily spotted heads have the throats unmarked; the opposite is also true.

Females in general resemble the holotype, and there is a strong tendency for the dorsal dark scales to be aligned into a series of dorsal longitudinal lines. The scapular blotch is dark and relatively well developed for the species, and the two included ocelli are cream and often rather large and not dot-like. Some large females have both dorsal and head patterns very obscured; even in such females, the scapular patch and ocelli are still evident. The ventral ground color is gray to yellowish, but the heavily pigmented scale edges give a dark squamate appearance to the venter. In some females, the throat is yellowish, and there are rarely any markings other than, at the extreme, a grayish suffusion or a few tiny scattered dark gray flecks. In both sexes the iris is brown.

Juveniles show the intensification of the female pattern; the dorsum is distinctly lined longitudinally, and the scapular patch and ocelli are conspicuous.

Comparisons.—In all body scale counts, *lycauges* averages lower than nominate *difficilis*; the differences in midbody means of 48.1 ± 0.7 (twice standard error of mean) in *difficilis* and 43.4 ± 0.6 in *lycauges* are statistically significant. The two subspecies are easily distinguished also by the lineate pattern and large scapular patch with ocelli in *lycauges* in contrast to the non-lineate pattern and reduction of the patch and a single ocellus in *difficilis*. Males of the two forms are less easily distinguished chromatically, but male *lycauges* appear to be less densely flecked with dark scales dorsally and generally have the heads with more dorsal dotting than do *difficilis*. The squamate ventral appearance of both sexes of *lycauges* is not a common feature of *difficilis*.

Despite the much longer series of *lycauges* than *difficilis*, many less specimens of the former have any keeling on the throat (five of 105 *lycauges* versus 30 of 65 *difficilis*). The two subspecies are about the same size, although male *lycauges* do not appear to reach so large a size as do male *difficilis* (32 versus 34), and female *lycauges* are slightly larger than female *difficilis* (34 versus 33). Modally, *lycauges* has 11 fourth toe lamellae, whereas *difficilis* has 10.

Remarks.—*Sphaerodactylus d. lycauges* is quite common at Cap-Haïtien and Bombardopolis, but it appears to be rare in non-urban situations. Because most of the Cap-Haïtien specimens were native collected, we have no precise ecological data on them,

but presumably most were taken within the city itself. Elsewhere, in edificarian situations, specimens have been taken under trash in *caféières* (Balladé), under a fallen thatch roof (Deux Garçons), and in a semi-xeric *caféière-cacaoière* (Carrefour La Mort), as well as under scattered leaf litter on a xeric hillside (Cormier Plage). I have the impression that this subspecies prefers edificarian situations and elsewhere is found most commonly in mesic rather than xeric areas, although it does not shun the latter completely.

The distribution of *S. d. lycauges* extends from the Presqu'île du Nord Ouest east along the northern Haitian littoral to between Terrier Rouge and Ouanaminthe, and thence inland (in the central portion of this range) to Dondon, Ennery, and Terre Sonnain and above Carrefour Joffre near Gonaïves. How the sphaerodactyls have reached the valley of the Rivière d'Ennery and onto the southern slopes of the Montagnes de Terre Neuve remains uncertain; we have never collected the species at higher elevations (1,000 m) in the area near Carrefour Marmelade so that its route of entry to these interior areas is not directly across the Chaine de Marmelade. Maximum elevation (397 m) is in the vicinity of Dondon, but the specimens from Bombardopolis show that in the west these geckos ascend to elevations of slightly less than 500 m on the Plateau de Bombardopolis in the Montagnes du Nord Ouest. The eastern limit of *S. d. lycauges* appears to be the Rivière Massacre, but in the Monte Cristi region in the República Dominicana, on the east side of the Rivière Massacre, there seems to be some genetic effect of *lycauges* (see later discussions). Aside from the very short series from Hinche in central Haiti, *S. difficilis* remains unknown from elsewhere in Haiti.

The long series from Bombardopolis may represent still another subspecies of *S. difficilis*. Although there appear to be no scale differences between the Bombardopolis and more eastern samples, the Bombardopolis females to a large extent lack a dorsal lineate pattern and seem (as preserved) paler in general than the much darker lots from the type-locality and elsewhere (including Port-de-Paix and Môle St. Nicholas) on this coast.

Etymology.—The name *lycauges* is from the Greek meaning "at the gray twilight," a reference to the time of activity of these geckos.

Sphaerodactylus difficilis euopter, new subspecies

Holotype.—CM 54142, an adult female, from the vicinity of Palmiste, Ile de la Tortue, Haiti, one of a series collected by natives for C. Rhea Warren on 15–17 August 1970. Original number ASFS V20223.

Paratypes.—ASFS V20213–16, ASFS V20222, ASFS V20224–27, ASFS V20237, CM 54143–47, MCZ 125643–49, USNM 194019–25, same data as holotype.

Definition.—A subspecies of *S. difficilis* characterized by a combination of moderate number of dorsal scales (24–31) between axilla and groin, low number (41–50) of midbody scales, both male and female shoulder patterns consisting of a large black scapular patch with two included white ocelli (Fig. 2D), and females with a dorsal pattern of four longitudinal orange lines.

Distribution.—Ile de la Tortue, Haiti.

Description of holotype.—An adult female with a snout–vent length of 29 mm, tail length 19 mm; dorsal scales axilla to groin 28, midbody scales 46, supralabials to mid-eye 3/3, 1 internasal, fourth toe lamellae 11, gular, chest, and ventral scales smooth.

Dorsal ground color tan with four longitudinal orange lines in life, of which the lateralmost on each side begins at the eye and extends almost to the groin, the two dorsalmost begin abruptly behind the black scapular patch, the lines fairly conspicuously outlined with dark brown to black; head pattern trilineate but somewhat blurred, the pale interspaces between the lines with dark brown stippling; scapular patch large, black, roughly triangular with its apex pointed anteriorly and including two white ocelli, the lateral corners of the triangle abutting upon the lateralmost of the orange longitudinal lines, and the entire shoulder figure in a clear tan area; tail vaguely lined dorsally with tan and brown; venter yellow-gray, with some dark brown scale-edging posteriorly to give a squamate appearance; throat concolor with venter and with some vague scattered grayish flecks; iris yellow.

Variation.—Thirty *S. d. euopter* have the following measurements and counts: largest males (ASFS V20215, ASFS V20216) 27 mm snout–vent length, largest female (CM 54142—holotype) 29 mm; dorsal scales between axilla and groin 24–31 (27.8); ventral scales between axilla and groin 23–31 (26.7); midbody scales 41–50 (45.3); supralabials to mid-eye 3/3 (23 individuals) or 4/4 (1); internasals 1 (29) or 2 (1); fourth toe lamellae 9–14 (10.9; mode 11); throat scales almost always smooth (one specimen has the throat scales partially keeled); escutcheon 4–6 (4.7) by 10–24 (17.0).

Males are tan to (rarely) brown dorsally with a combination of isolated dark brown to black scales and vague longitudinal buffy to tan lines. The heads

and throats are orange; the tops of the heads are variably spotted with black, and the throats are heavily spotted with black; the degree of throat spotting is variable and correlated with the degree of dorsal head spotting. The venter is dark gray and has dark brown scale edges to give a squamate appearance. All (nine) males have a conspicuous black scapular patch with two included white ocelli; the patch is basically triangular with its apex pointed anteriorly, but it tends to be somewhat cordate in shape (indented along its posterior edge) in some specimens (MCZ 125649), and it may be somewhat reduced in intensity but nonetheless quite obvious (MCZ 125643).

Females have the dorsum tan to rich brown with four longitudinal orange lines, outlined with dark brown to black. The head pattern is trilineate but in most adult females is somewhat blurred with additional dark brown stippling in the tan to buffy-tan interspaces between the three head lines. The scapular patch is large, black, and has two included white ocelli. Although the patch is usually triangular, it may be cordate as in the males. The pale head lines may terminate anterior to the black patch and join transversely with each other by means of a pale bar (ASFS V20225). The preocular portions of all dark head lines are especially diffuse, and the median line is obscure or even absent in most specimens. The ventral color varies between yellow-grey to flesh, and the dark scale edges give a squamate appearance to the belly. The iris in both sexes is yellow.

Juveniles are patterned like females, but the pattern is more vivid, and the dorsal longitudinal lines are especially distinct (but less bright) than in the adults.

Comparisons.—There is no difficulty in separating *euopter* from nominate *difficilis,* because in the latter subspecies females have a small black scapular patch with only a single ocellus, and both ocelli and patch are absent in male *difficilis.* The differences between adjacent *lycauges* on the Haitian mainland and *euopter* on Tortue are less obvious but nevertheless are quite striking. Male *lycauges* lack a scapular patch and ocelli, whereas these features occur in all *euopter.* Although female *lycauges* tend toward a lineate dorsal pattern, it is never so discrete and striking as in female *euopter.* The heads of male *lycauges* are faintly orange, dark yellow-grey, or orange-gray, whereas those of male *euopter* are much brighter orange. The two subspecies also differ in maximum size; male *lycauges* reach a size of 32 mm, females 34 mm, in contrast to 27 mm and 29 mm in male and female *euopter.* In general, *lycauges* is a larger and huskier lizard than is *euopter.* In addition, only in *euopter,* of all the subspecies of *S. difficilis,* do both sexes have a well developed scapular patch and ocelli, and the name *euopter* is an allusion to this condition.

Remarks.—*S. d. euopter* appears to be fairly common on Ile de la Tortue, at least in the Palmiste area. Warren stated that this region is mesic, but because the specimens were taken by natives, we have no concrete data on the habitats involved.

There is little doubt that *euopter* is a local insular derivative of *lycauges.* The two subspecies resemble each other in the female lineate pattern (although this is much less well expressed in the latter subspecies) and the distinctly squamate appearance of the venter because of the darkly pigmented scale edges. However, *euopter* is quite distinctive when compared directly with *lycauges.*

Sphaerodactylus difficilis typhlopous, new subspecies

Holotype.—USNM 166966, an adult female, from 3 km NE Sosúa, Puerto Plata Province, República Dominicana, one of a series collected by Richard Thomas on 15 October 1963. Original number ASFS V1660.

Paratypes.—ASFS V1654–56, ASFS V1661–63, ASFS V1666–69, CM 52260–63, USNM 167273, same data as holotype; USNM 167274, same locality as holotype, hatched from egg taken 15 October 1963 by R. Thomas; USNM 167276, Sosúa, Puerto Plata Province, República Dominicana, A. Schwartz, 19 October 1963; ASFS V1688, 8 km E Imbert, 1,100 ft (336 m), Puerto Plata Province, República Dominicana, R. Thomas, 17 October 1963; ASFS V32188–208, Hojas Anchas, 9.0 mi (14.4 km) NE Altamira, *ca.* 800 ft (244 m), Puerto Plata Province, República Dominicana, D. C. Fowler, A. Sehwartz, B. R. Sheplan, 27 October 1971; ASFS V33734–67, 3.2 mi (5.1 km) SE Gaspar Hernández, Espaillat Province, República Dominicana, D. C. Fowler, B. R. Sheplan, 10 November 1971; ASFS V33769–80, 3.0 mi (4.8 km) NW Gaspar Hernández, Espaillat Province, República Dominicana, D. C. Fowler, B. R. Sheplan, 10 November 1971.

Associated specimens.—República Dominicana: *Monte Cristi Province,* 1 km S Palo Verde (ASFS V1339–46, ASFS V17640–44); 4 km SE Monte Cristi (ASFS V17632); Cana, 14.4 mi (23.0 km) NW Mao, 300 ft (92 m) (ASFS V33253). *Cayos Siete Hermanos,* Isla Monte Grande (ASFS V17705–09); Isla Monte Chico (ASFS V17691–94); Isla Muertos (USNM 76718–23). *Valverde Province,* 5.9 mi (9.4 km) N Cruce de Guayacanes (ASFS V32023). *Santiago Rodríguez Province,* 1.8 mi (2.9 km) W Los Quemados, 500 ft (153 m) (ASFS V32069, ASFS V33476); 3.3 mi (5.3 km) W Los Quemados, 850 ft (259 m) (ASFS V33474–75). *Santiago Province,* 3.4 mi (5.4 km) SE Los Montones, Río Bao, 1,600 ft (488 m) (ASFS V33781); Río Bao, 5 km SE Los Montones Abajo, 610 m (ASFS V41001–03).

Definition.—A subspecies of *S. difficilis* characterized by a combination of high number of dorsal scales (25–34) between axilla and groin, moderate number of midbody scales (41–53), female shoulder pattern of scapular blotch and ocelli absent or vaguely indicated (Fig. 2E), and males without indication of scapular patch or ocelli.

Distribution.—República Dominicana, from the vicinity of Monte Cristi in the west, east as far as Gaspar Hernández, and inland to the vicinity of Los Quemados and Los Montones in Santiago Rodríguez and Santiago provinces; specimens from the western Valle de Cibao and the northern slopes of the interior Cordillera Central intergradient between *typhlopous, difficilis* and probably *lycauges* (see discussion); also the Cayos Siete Hermanos off the Dominican coast at Monte Cristi.

Description of holotype.—An adult female with a snout–vent length of 31 mm, tail length 23 mm, tail almost completely regenerated; dorsal scales axilla to groin 25, ventral scales axilla to groin 26, midbody scales 48, supralabials to mid-eye 3/3, 1 internasal, fourth toe lamellae 13, gular, chest, and ventral scales smooth.

Dorsal ground color medium brown with scattered darker brown and buffy dots giving a flecked appearance to the back. Three cephalic lines more or less diffuse, the median line very obscure and on the snout hardly differentiable from the tan head ground color; median line reduced on neck to two or three small, isolated, dark, more or less subcircular areas followed by two small blackish markings in the area of the scapular patch; ocelli and patch absent; ventrolateral neck stripe present and as bold as lateral head stripe; throat gray in life, venter grayish.

Variation.—The series of 85 *S. d. typhlopous* has the following measurements and counts: largest males (ASFS V32190, ASFS V32192) 33 mm snout–vent length, largest female (ASFS V33747) 32 mm; dorsal scales between axilla and groin 25–34 (30.3); ventral scales between axilla and groin 24–36 (30.0); midbody scales 41–53 (46.8); supralabials to mid-eye 3/3 (60 individuals); internasals 0 (1), 1 (79), 2 (4), 3 (1); fourth toe lamellae 9–15 (12.1; mode 11); throat scales almost always smooth (70 individuals) but rarely keeled (10) or partially keeled (5); escutcheon 3–6 (4.7) by 18–27 (21.8).

Males have the dorsum pinkish gray, tan, grayish brown, or brown, and, as full adults, have the back covered with a rather coarse marbling which apparently represents an expansion and fusion of a more orthodox salt-and-pepper pattern. The dark body pattern often extends onto the upper surface of the head, which may also be dotted with pale gray to buffy dots. The head is dull yellowish to bright yellow, and the dark head markings may be so extensive as to leave only a reticulum of the yellowish cephalic ground color exposed. The throats are bright orange, yellow-orange, gray, yellow-gray, or gray, and are either immaculate or have a dark brown pattern composed of a reticulum or isolated spots. The venter is grayish brown to yellowish gray. Only one adult male has an indication of a scapular pattern; in this specimen (ASFS V32191) there is a very small black scapular patch and two white ocelli which are peripheral to the patch remnants.

Females are in general like the holotype in color and pattern, but females from Hojas Anchas have a small black scapular patch and two white ocelli. One female and one juvenile from Gaspar Hernández have one tiny white ocellus but no dark scapular patch. Likewise, females from the western and southern portions of the range of *typhlopous* (Monte Cristi, Palo Verde, Los Quemados) have one or two small ocelli and a restricted black or dark seapular patch. These specimens are discussed below. The females are grayish to brown dorsally, and full adults have the back variously marbled with dark brown and tan with buffy or orange spots, so that the entire effect is a coarse salt-and-pepper condition. The three head lines are present, but the median line shows a strong tendency to be reduced on the snout, or at least very obscured on that portion of the head, due to the deposition of inter-stripe pigment. Throats are pale yellow to gray, usually immaculate, but in some specimens the throat is heavily clouded with gray or may even have a few to many dark brown to black flecks or spots. The venters are grayish to white and not obviously squamate. The iris is yellow.

Juveniles show an intensification of the female pattern. A hatchling from Sosúa (ASFS V2031) is dark brown with scatted pale ocelli over the back and sides, and of two juveniles (ASFS V32207–08) from Hojas Anchas, one has a small dark scapular patch and two ocelli, whereas the other has neither of these features indicated. Even in these very young juveniles (snout–vent lengths 15 to 18 mm), there is a tendency for the head lines to be obscure as in adult females.

Comparisons.—*S. d. typhlopous* females are readily differentiated from female *difficilis, lycauges,* and *euopter,* in that these three subspecies have

scapular patches with one or two ocelli, whereas no scapular pattern occurs except under very reduced conditions in *typhlopous*. Likewise, male *typhlopous* differ from male *euopter* in that they lack a scapular patch and ocelli, as well as being much more coarsely patterned dorsally. Male *typhlopous* resemble male *lycauges* and *difficilis*, but *typhlopous* males are more coarsely patterned dorsally and have (as full adults) more heavily spotted heads with a bright inter-spot reticulum. Female *typhlopous* and *euopter* are also distinguishable by the presence in the latter of four longitudinal orange lines.

In all body scale counts, *typhlopous* averages between *difficilis* and *lycauges*. In midbody scale counts, the mean of *typhlopous* (46.8 ± 1.5) is significantly different from *lycauges* (43.4 ± 0.6), but not from *euopter* (45.3 ± 1.1) or *difficilis* (48.1 ± 0.7). The mean (12.1) of fourth toe lamellae is greater than the means of *difficilis, lycauges,* and *euopter,* although the mode of 11 in *typhlopous* is identical with the modes in *lycauges* and *euopter; difficilis* has a mode of 10.

Remarks.—*S. d. typhlopous* occupies the northern Dominican lowlands north of the Cordillera Septentrional (on whose southern slopes occurs *S. d. difficilis*). Present material does not demonstrate intergradation between these two subspecies in southern Puerto Plata Province, but almost certainly intergrades will be encountered in this region because *typhlopous* occurs (farther to the west at Imbert and Hojas Anchas in the northern foothills of this range) at elevations of 1,100 ft and about 800 ft (336 and 244 m) and very likely ascends to the northern slopes of the Septentrional to intergrade with *S. d. difficilis*.

Elsewhere, I interpret speeimens from at least the western Valle de Cibao and the northern flank of the Cordillera Central as being intergradient between *difficilis, typhlopous,* and *lycauges*. Throughout much of this area of presumed intergradation, there are only single specimens from most localities. The exception is south of Palo Verde, whence there are 13 lizards. A few individuals from the Monte Cristi-Palo Verde area have a small scapular patch and one (sometimes two) tiny gray ocelli. A female from north of Cruce de Guayacanes has a reduced black scapular patch and two peripheral ocelli. Two females from Los Quemados have a much reduced dark brown scapular patch with either one or two tiny gray ocelli. However, a female from Cana has neither patch nor ocelli. All in all, we suggest that these specimens show both influence of *difficilis* (small patch, one ocellus) and *lycauges* (large patch, two ocelli) upon an otherwise *typhlopous* population. The western portion of the Cordillera Septentrional is low and arid (in contrast to the mesic forested uplands of this range in its eastern and central portions), and *S. d. typhlopous* has crossed the mountains in this western region. *S. d. difficilis* occurs in the extreme eastern portion of the xeric Valle de Cibao in the vicinity of Santiago. Probably this subspecies occurs farther to the west in this valley and finally meets *typhlopous* at its western extremity. However, the presence of a reduced scapular patch and two ocelli is not characteristic of either *typhlopous* or *difficilis*; it is characteristic of the more western *lycauges,* which is known from very close (45 km at Terrier Rouge) to the Dominico-Haitian border where intergradient specimens occur. The major geographic barrier between *lycauges* and the intergradient specimens is the Rivière Massacre, and it seems likely that there has been some genetic exchange across this river between *lycauges* and *typhlopous*.

The topotypic series of *S. d. typhlopous* was secured in seagrapes (*Coccoloba*) and almonds (*Terminalia*) along the coast, and a single juvenile was found in a hotel bungalow at Sosúa. The lizard from Imbert was taken under palm trash on a mesic hillslope, and geckos were secured at Palo Verde in dry logs, under termitaria, and in piles of dry wood, sticks, leaves, and palm slats in riverine woods and adjacent to a banana grove. The lizard from Monte Cristi was taken in old palm trash at a garbage dump in *Acacia*-cactus lowlands. The long series from Hojas Anchas was taken from within a stack of very old logs in the sheltered yard of an abandoned sugar mill, and those from Gaspar Hernández were secured in coastal *Cocos* trash.

Perhaps the most unusual situation for *S. difficilis* is shown by the specimens from Los Quemados. One of these (ASFS V32069) was taken from under bark and a woody bracket-fungus 6 ft (1.8 m) up on a leguminous tree in rather mesic riverine woods in otherwise very xeric country. Another lizard was seen 12 ft (3.7 m) up in a similar tree at the same locality. Both trees were alive but riddled with termites and had cavities filled with termitaria. A third lizard was taken from a hollow decayed tree limb at this locality. Of two lizards (ASFS V33474–75) from this same region, one was taken under the bark of a standing dead tree in a shaded but not mesic *Acacia* ravine, and the second was secured in trash at the base of a tree. The occurrence of *S. difficilis* in any situation above the ground surface is unusual, and it is remarkable that three lizards were seen or

taken in this situation in the Los Quemados area. The generally xeric habitats of the western Cibao may restrict *S. difficilis* to more mesic situations in the valley and may even have compelled the lizards to becoming partially arboreal in this region. The specimens from Los Montones, which lies at an elevation of 1,600–2,000 ft (488–610 m), were native-collected; the area there is mesic deciduous canopy forest, quite different from areas occupied by *S. d. typhlopous* in the floor of the Valle de Cibao.

S. difficilis from the Cayos Siete Hermanos (15 specimens from three islets) we group tentatively with *typhlopous*. These lizards do not differ in scale counts from our series of *typhlopous*, and females lack scapular patches and ocelli as does that subspecies. There is, however, a strong tendency for the females and juveniles to be lineate dorsally (ASFS V17694, ASFS V17708, USNM 76718). The location of the Siete Hermanos, off the northern coast near the Bahía de Manzanillo, and thus close to the ranges of both *lycauges* to the west and *typhlopous* to the east, and the presence in this region of the mouths of the Rivière Massacre (which separates the ranges of *lycauges* and *typhlopous*) and the Río Yaque del Norte, suggests that these islands have been colonized fortuitously by individuals of both subspecies. Thus the lineate pattern of female and juvenile Siete Hermanos *S. difficilis* may be the result of advent of *lycauges* upon an otherwise more or less *typhlopous* population.

S. d. typhlopous is known to be sympatric with *S. darlingtoni* at one locality (north of Cruce de Guayacanes) in the western (but very mesic) portion of the Cordillera Septentrional; at this locality, *S. darlingtoni* far outnumbers *S. difficilis*. Presumably the two species occur sympatrically elsewhere in the central and western Cordillera Septentrional, but *S. darlingtoni* has not as yet been collected at La Cumbre, where *S. difficilis* is extremely abundant. The two species are easily distinguished in this region, since *S. d. darlingtoni* has a greater number of midbody scales (48–59) than does *S. d. typhlopous* (41–53) and is a much smaller lizard (males 25, females 29 snout–vent length) than is *S. d. typhlopous* (males 33, females 32 snout–vent length).

Etymology.—The name *typhlopous* is from the Greek for "stepping in blindness," an allusion to the usual absence of ocelli in this subspecies.

Sphaerodactylus difficilis peratus, new subspecies

Holotype.—CM 52264, an adult female, from 5 km NW Los Yayales, María Trinidad Sánchez Province, República Dominicana, one of a series collected by Albert Schwartz and Richard Thomas on 30 October 1963. Original number ASFS V1923.

Paratypes.—ASFS V1919–22, ASFS V1924–29, same data as holotype; CM 52265–70, USNM 167277–81, same locality as holotype, A. Schwartz, 18 July 1968; 1.4 mi (2.2 km) SE Los Yayales, María Trinidad Sánchez Province, República Dominicana, A. Schwartz, 24 November 1971; MCZ 119368, 6 km SE Nagua, María Trinidad Sánchez Province, República Dominicana, R. Thomas, 26 October 1963; MCZ 119367, 3.3 km S Cabrera, María Trinidad Sánchez Province, República Dominicana, R. Thomas, 29 November 1964; LSUMZ 21915–19, 4.8 km S Cabrera, María Trinidad Sánchez Province, República Dominicana, D. W. Buden, R. Thomas, 29 November 1964; ASFS V33704–31, 2.1 mi (3.4 km) NE Río San Juan, María Trinidad Sánchez Province, República Dominicana, D. C. Fowler, B. R. Sheplan, 10 November 1971; ASFS V16069, 4 km N Azucey, María Trinidad Sánchez Province, República Dominicana, A. Schwartz, 23 December 1968; ASFS V34161, 1.0 mi (1.6 km) S Caño Abajo, María Trinidad Sánchez Province, República Dominicana, native collector, 24 November 1971; ASFS V34239–59, 1.0 mi (1.6 km) S Caño Abajo, María Trinidad Sánchez Province, República Dominicana, native collectors, 26 November 1971; MCZ 43395–96, Sánchez, Samaná Province, República Dominicana, P. J. Darlington, July 1938.

Definition.—A subspecies of *S. difficilis* characterized by a combination of very high number of dorsal scales (28–40) between axilla and groin, very high number of midbody scales (46–60), female shoulder pattern of scapular blotch and ocelli absent (Fig. 2F), and males without indication of scapular patch and ocelli.

Distribution.—República Dominicana, the northeastern coast and inland in mesic situations, from Río San Juan on the north to Azucey on the south, and east (apparently) to Sánchez on the base of the Península de Samaná.

Description of holotype.—An adult female with a snout–vent length of 28 mm, tail length 23 mm, almost completely regenerated; dorsal scales axilla to groin 38, ventral scales axilla to groin 29, midbody scales 58, supralabials to mid-eye 4/4, internasals 1, fourth toe lamellae 13, gular scales keeled, chest and ventral scales smooth.

Dorsal ground color dark brown, heavily flecked with black to dark brown, the flecking more or less aligned into a series of about seven longitudinal stripes, all of which are narrow and relatively indistinct; head pattern trilineate but median line absent on snout, thrice constricted behind eyes, and disappearing abruptly before reaching scapular area which is occupied by a series of tiny black longitudinal flecks which may be remnants of the scapular patch; ocelli absent; snout heavily strippled with brown; venter and throat cream, throat flecked with numerous tiny brown flecks.

Variation.—The series of 83 *S. d. peratus* has the following measurements and counts: largest male (ASFS V34240) 33 mm snout–vent length, largest female (ASFS V33721) 33 mm; dorsal scales between axilla and groin 28–40 (34.0); ventral scales between axilla and groin 26–35 (29.4); midbody scales 46–60 (51.8); supralabials to mid-eye 3/3 (43 individuals), 2/2 (1), 3/4 (5), 4/4 (3), 4/5 (1); internasals 0 (2), 1 (81); fourth toe lamellae 10–14 (12.4; mode 13); gular scales smooth (41 individuals), weakly keeled (15) or strongly keeled (25), chest and ventral scales smooth; escutcheon 3–8 (5.0) by 8–30 (23.2).

Males are brownish gray to tan or dark brown, regularly heavily spotted dorsally with dark brown; the heads are yellowish with dark brown spots, often with additional white, cream, or pale yellow frosting. One male also had some scattered yellow scales between the brown spots on the back. Throats are yellow to orange-yellow, usually immaculate; a few males have the throat marked with discrete dark brown dots or marbling. The ventral color varies from grayish brown to tannish gray or yellowish gray. There is no indication of the scapular patch or ocelli.

Females are much less heavily marked than males, and the dorsum is salt-and-pepper with the dark scales often arranged into more or less distinct longitudinal lines. The head pattern is distinet behind the eyes but is often obscured on the snout. In some individuals (ASFS V1924, ASFS V4257, both adults) the median head line continues down the midline of the back, and a young individual (ASFS V1925) also shows this condition very clearly. The dorsum is light gray to dark brown, and the dorsal markings are thus variably visible against a dark ground. The scapular patch and ocelli are absent. The venters are light gray, and the throats are cream, pale yellow, or yellow, with a few tiny scattered brown flecks. The iris is yellow to brown or gray-brown in both sexes.

Juveniles are patterned like females, but all pattern elements are more distinct; as noted above, the lineate female pattern is expressed in some juveniles (ASFS V14103, ASFS V1925) even more clearly than in the adults.

Comparisons.—In lacking a scapular pateh and ocelli in females, *S. d. peratus* differs from *difficilis, lycauges,* and *euopter,* all of which have these pattern elements expressed. From *typhlopous,* which also usually lacks the patch and ocelli, *peratus* differs in much higher midbody scale counts (means 51.8 ± 0.8 in *peratus,* 46.8 ± 1.5 in *typhlopous*). In fact, the higher mean in *Peratus* midbody counts is significantly different from those of all other subspecies of *S. difficilis.*

The mean of dorsal scale counts in *peratus* is also higher than those of all other subspecies. *S. d. peratus* also has a very high percentage of specimens with keeled gular scales (including individuals with at least some keeling); the percentage in *peratus* (49%) is higher than that in *difficilis* (47%). Male *S. d. peratus* are distinguishable from males of the other subspecies in being heavily spotted dorsally.

Remarks.—At the type-locality and Nagua, *S. d. peratus* was collected in palm trash along a sandy beach, where the geckos were extremely abundant. Elsewhere, lizards were taken under trash in *Theobroma* groves (Azucey, San Francisco de Macorís), and under *Cocos* trash (San Francisco de Macorís, Caño Abajo).

Shreve (1968) described *S. clenchi* as a species distinct from *S. difficilis*; the former occurs on the Península de Samaná. *S. clenchi,* surely a *S. difficilis* derivative, differs from *S. difficilis* in that the former lacks sexual dichromatism and has very small dorsal scales (and thus has very high body scale counts). It is interesting that *S. d. peratus,* that subspecies of *S. difficilis* which occurs closest to *S. clenchi* (and even apparently sympatrically with it at Sánchez at the base of the Península de Samaná), has the smallest scales and thus the highest body scale counts of all the subspecies of *S. difficilis.*

Intergradation between *peratus* and *typhlopous* remains as yet unknown. The two subspecies approach each other rather closely at Sosúa and Gaspar Hernández, a distance of about 35 km airline, yet there is no especial tendency for specimens from either of these localities to have higher or lower scale counts than lizards from other localities well within the respeetive ranges of either subspeeies. Likewise, material is still lacking between the Nagua-Los Yayales-Azucey area on one hand and Los Bracitos on the other—a distanee of about 38 km airline. It should be recalled that *S. d. difficilis* occurs at Los Bracitos, a locality in the extreme eastern uplands of the Cordillera Septentrional, whereas in this region, *peratus* is known only from lowland and more or less coastal localities.

S. d. peratus is broadly sympatric with *S. darlingtoni.* The local subspecies of the latter (*S. d. noblei*) has dorsal, ventral, and midbody scale counts reaching less high extremes than does *peratus,* but the ranges in all these counts overlap broadly. How-

ever, *S. d. noblei* is a much smaller lizard (snout–vent lengths in males to 25 mm, in females to 27 mm) than is *S. d. peratus* (males and females both to 33 mm). *S. d. noblei* is a dark brown lizard and has a scapular pattern, whereas *S. d. peratus* is generally paler and lacks a scapular pattern.

Etymology.—The name *peratus* is from the Greek for "that which may be passed over" in allusion to the pattern similarities between this subspecies and *S. d. typhlopous.*

Sphaerodactylus difficilis diolenius, new subspecies

Holotype.—USNM 166967, an adult female, from 2 mi (3.2 km) SE San Cristóbal, San Cristóbal Province, República Dominicana, one of a series collected by Albert Schwartz and Richard Thomas on 15 June 1963. Original number ASFS V7777.

Paratypes.—ASFS V7776, ASFS V7778–80, same data as holotype; ASFS V34971–72, La Romana, La Romana Province, República Dominicana, 17 November 1971, D. C. Fowler, B. R. Sheplan; ASFS V28901–06, 1.8 mi (2.9 km) S Boca del Soco, San Pedro de Macorís Province, República Dominicana, 16 July 1971, D. C. Fowler, A. Schwartz; USNM 167282–88, Villas del Mar, 5 km E Guayacanes, San Pedro de Macorís Province, República Dominicana, 5 June 1969, J. A. Rodgers, Jr., A. Schwartz; LSUMZ 21920–31, 1 km W Guayacanes, San Pedro de Macorís Province, República Dominica, 2 August 1968, J. K. Lewis, A. Schwartz; MCZ 119369–70, 8 km E Boca Chica, San Pedro de Macorís Province, República Dominicana, 21 July 1964, R. Thomas; AMNH 49990–92, 31 mi (50.6 km) E Santo Domingo, San Pedro de Macorís Province, República Dominicana, 1 August 1935, W. G. Hassler; CM 52271–73, 7 mi (11.2 km) E Boca Chica, San Pedro de Macorís Province, República Dominicana, 14 June 1963, D. C. Leber; MCZ 119371–72, LDO 7-5219–23, Aeropuerto Punta Caucedo (=Aeropuerto Internacional de las Américas), Distrito Nacional, República Dominicana, 9 July 1968, R. K. Bobilin, J. K. Lewis, J. B. Ober, L. D. Ober, R. A. Ober, A. Schwartz; ASFS V598, 5.5 km NE Guerra, Distrito Nacional, República Dominicana, 22 August 1963, D.C. Leber; CM 52274–77, 6.7 km S Bayaguana, Distrito Nacional, República Dominicana, 22 August 1963, D. C. Leber, R. Thomas; ASFS X7743–53, 9.8 mi (15.7 km) E Santo Domingo, Distrito Nacional, República Dominicana, 14 June 1963, R. F. Klinikowski, D. C. Leber, R. Thomas; USNM 167289–93, Santo Domingo (Hotel Jaragua), Distrito Nacional, República Dominicana, 13 June 1963, D. C. Leber, R. Thomas; CM 52278, Santo Domingo, old airport, Distrito Nacional, República Dominicana, 17 July 1963, R. Thomas; ASFS V2472, 8.5 km W Santo Domingo, Distrito Nacional, República Dominicana, 20 June 1964, R. Thomas; ASFS V28487–90, 9.2 km W Río Ozama, west of Santo Domingo, Distrito Nacional, República Dominicana, 23 June 1971, D. C. Fowler, A. Schwartz; MCZ 119373, 17 km NW Santo Domingo, Distrito Nacional, República Dominicana, 24 July 1964, R. Thomas; ASFS V4149, 17 km NW Santo Domingo, Distrito Nacional, República Dominicana, hatched from egg between 1–7 September 1964.

Associated specimens.—REPÚBLICA DOMINICANA: *La Altagracia Province,* 12 km E Otra Banda (ASFS V17618); Higüey (ASFS V21832); 3.2 mi (5.1 km) W Higüey (ASFS V759–62). *El Seibo Province,* 7 km W El Cuey (ASFS V17586–609); 1.1 mi (1.8 km) W Miches (ASFS V28785); 3.3 mi (5.3 km) SW Miches (ASFS X7900–01); 3 km N El Valle (ASFS V3159); 2.6 km N Hato Mayor (ASFS V35291–92); 3.5 mi (5.6 km) S Sabana de la Mar (ASFS X7938–39); Sabana de la Mar (ASFS V3123–24); Cuevas de Caño Hondo (ASFS V35285–90); north side of sheltering peninsula of Bahía de San Lorenzo, approximately 2 km E of tip (ASFS V3152–56); 20.2 mi (32.3 km) NW, 3.4 mi (5.4 km) N La Vacama, Playa de Guaco (ASFS V29393–414). *San Pedro de Macorís Province,* 1 km W San Pedro de Macorís, west side of Río Magua (ASFS V41041–51). *San Cristóbal Province,* 7 km SE Yamasá, 122 m (ASFS V40926–28); 3.4 mi (5.4 km) W Sabana Grande de Palenque (ASFS X7178–79); 2 km E Juan Barón (ASFS V28519–20). *La Vega Province,* 1.5 km W Jayaco, 183 m (ASFS V40862). *Peravia Province,* 4.8 mi (7.7 km) S Baní (ASFS V29441–51). *Azua Province,* 9.7 mi (15.5 km) E Azua (ASFS X8067–94, ASFS V19335–51, ASFS V21102–04); 2.7 mi (4.3 km) W Azua (ASFS V31039–50); Monte Río (ASFS V21164); 4 km W, 6 km N Azua (ASFS V21168–71); Barreras (ASFS V21272–358, ASFS V31033, ASFS V31069–175); 12.4 mi (19.8 km) SE Guanito, 900 ft (275 m) (ASFS V31338–41). *San Juan Province,* San Juan (ASFS V402); 15 km SE San Juan (ASFS V411); 15 km E San Juan (ASFS V21545–48). *Sánchez Ramírez Province,* 1 km SE La Mata (ASFS V18579, ASFS V33667). *Province unknown,* Isla Pascal, Bahía de Samaná (AMNH 41979–85).

Definition.—A subspecies of *S. difficilis* characterized by a combination of moderate number of dorsal scales (23–35) between axilla and groin, moderate number of midbody scales (40–53), female shoulder pattern consisting of a pair of pale ocelli and without a scapular patch (at best represented by a diffuse dark bar between ocelli), and males without indication of scapular patch but ocelli usually present (Fig. 2G).

Distribution.—República Dominicana, from the Valle de San Juan (San Juan) and the Llanos de Azua (Barreras) in the west, east to La Romana Province (La Romana) along the coast, and inland as far as La Vega Province (Jayaco) and Sánchez Ramírez Province (La Mata), thence east to El Seibo Province (Hato Mayor and north to Sabana de la Mar), east along the coast of the Bahía de Samaná as far as the vicinity of Laguna Redonda and thence south to La Altagracia Province (Otra Banda, Higüey); presumably also the subspecies at Hinche, Dépt. de l'Artibonite, Haiti.

Description of holotype.—An adult female with a snout–vent length of 30 mm, tail length 24 mm; dorsal scales axilla to groin 31, ventral scales axilla to groin 27, midbody scales 44, supralabials to mideye 3/3, 1 internasal, fourth toe lamellae 11, gular, chest, and ventral scales smooth.

Dorsal ground color medium tan with gray scales arranged in a series of about five very broken lon-

gitudinal lines and with scattered dull orange dorsal ocelli. Three cephalic lines clear, the median one broken in the interorbital region; scapular patch restricted to a small bar between the two white ocelli; ventrolateral postauricular stripe present and moderately prominent; venter gray in life, throat with scattered dark brown flecks.

Variation.—Four hundred forty-six *S. d. diolenius* have the following measurements and counts: largest males (ASFS V31069, ASFS V31338) 32 mm snout–vent length, largest females (ASFS V21275, ASFS V31094) 33 mm; dorsal scales between axilla and groin 23–35 (28.0); ventral scales between axilla and groin 24–37 (29.8); midbody scales 40–53 (46.6); supralabials to mid-eye 3/3 (272 individuals), 3/4 (9), 4/4 (3); internasals 1 (400), 0 (18), 2 (22), 3 (3); fourth toe lamellae 7–15 (10.9; mode 11); gular scales usually smooth (417 individuals) but occasionally keeled (7) or slightly keeled (14); escutcheon 3–8 (5.5) by 8–26 (17.8).

Because of its broad distribution, *S. d. diolenius* is somewhat more variable both in dorsal ground color and pattern than are any of the other subspecies. Males have been recorded as tan, sandy, yellowish tan, brown, dark brown, gray or even black dorsally; the upper surface of the head is often orange to grayish yellow, and may or may not have dark brown spots or dots overlying the brighter ground color. The dorsum is heavily spotted, the dark brown spots arranged in a lineate pattern, although this seems to be a condition more prevalent in fully adult males. In some smaller males, the dorsum is salt-and-pepper. A pair of pale yellow, buffy, or white ocelli is very regularly present, at times darkly outlined and rarely connected by a very narrow and diffuse darker area which is a remnant of the juvenile pattern. The throat varies from grayish to yellow or orange, usually in the case of the latter brighter colors corresponding in intensity to the color of the head. Throat markings vary from scattered brown flecks or dots to a more complete dark reticulum; the degree of throat markings is correlated with the amount of dark head markings. The ventral color was recorded as grayish brown, grayish yellow, yellowish brown, pinkish, light gray, dull gray-orange, gray, or flesh. Some males have a fairly prominent pair of orange ocelli at the base of the tail, and the tail is usually yellowish above and below, often in strong contrast to the more sombre tones of the dorsum and venter.

Females have been recorded as tan, dark brown, wood brown, or yellowish tan; no females were reported as gray dorsally. The pattern of the back consists of dark brown scales arranged in a more or less lineate pattern. The usual head pattern is boldly trilineate, and the median line is seldom complete anterior to the eyes. The scapular patch is absent or at best restricted to a dark bar lying between the ocelli which are pale yellow, white, or pale buffy. Females often have scattered orange spots or buffy flecking on the dorsum, and there may be a pair of yellow ocelli at the beginning of the tail. The ventral color was recorded as brown, dark brown, gray, yellowish brown, pale yellow-gray, gray-orange, flesh, or yellow-gray. The upper surface of the head and the throat are not orange or yellow but are unicolor with the dorsum and venter respectively. The throat pattern consists of grayish to brownish flecking or marbling; some females, especially subadults, lack any prominent throat markings. The iris color is regularly yellow or yellow-brown in both sexes.

Juveniles are colored and patterned like females; the tail is orange dorsally and ventrally. In hatchlings, the tip the tail is white, followed by a broad black band.

Comparisons.—*S. d. diolenius* has a moderate number of midbody scales (mean 46.6 ± 0.3) and in this character differs significantly from the subspecies *difficilis, lycauges,* and *peratus.* The number of dorsal scales between the axilla and groin in *diolenius* averages less than those in *difficilis, typhlopous,* and *peratus,* and greater than those in *lycauges* and *euopter.* Female *diolenius,* with a pair of ocelli and (at best) a small scapular patch or with the patch absent, differ from female *difficilis, typhlopous,* and *peratus,* all of which have either one ocellus or no ocelli, and the patch either well expressed or absent. From *euopter,* female *diolenius* differ in having a much more reduced scapular patch and in lacking the distinct longitudinal orange lines. Female *diolenius* most closely resemble female *lycauges* in northern Haiti, but *lycauges* has less midbody scales (means 43.4 ± 0.6 versus 46.6 ± 0.3), and the ranges of the two subspecies are widely separated by (for the most part) the interior Dominican Cordillera Central, although *diolenius* possibly extends into the Plateau Central in Haiti (see Remarks). Even if the Plateau Central is occupied by *diolenius,* this subspecies and *lycauges* are probably separated by the Massif du Nord. Male *diolenius* have a pair of pale ocelli and thus are easily differentiated from males of all other subspecies thus far described, with the exception of *euopter.* Males of the latter subspecies have a prominent black scapular patch with ocelli,

whereas the patch is never present in *diolenius*. It should also be noted that male *lycauges* occasionally have ocelli present, much as in the regular fashion of male *diolenius*.

Remarks.—*S. d. diolenius* is the most widely distributed of the subspecies, occupying most of eastern and central-southern República Dominicana. Shreve (1968) noted the occurrence of "*S. notatus difficilis*" at Hinche in central Haiti. I have examined the four specimens (BMNH 1948.1.4.27–.30) upon which Shreve based his record; the series consists of one adult and one subadult female, and one adult and one subadult male. Shreve (1968:5), quoting field notes on this series, stated that the upper surfaces were fawn brown, prominently spotted with jet black. There were two white ocelli which lay lateral to a pair of jet black spots. The two males now lack scapular patches and ocelli (and thus differ from most male *diolenius*) and have the dorsum with scattered darker brownish dots. The larger male lacks head pattern or dotting, and the smaller has some faint brownish dotting on the head. Both are very drab lizards. The larger female has the typical trilineate *diolenius* head pattern, with the body heavily dotted with dark brown, and with two very prominent ventrolateral lines which extend to the forelimb insertion. The black scapular patch is reduced to an elongate bar (which is nevertheless conspicuous) with a pair of pale ocelli. The smaller female resembles the larger female closely in scapular pattern, but the dorsum is more lineate than dotted. There is nothing distinctive about the body scale counts, except that the midbody scales for the smaller female are 39, slightly less than the low count of 40 for the long series of *diolenius*. The internasals are exceptionally variable, since in the series of four lizards there are counts of 0, 1, 2, and 3. I include these Haitian lizards with *S. d. diolenius* only provisionally. The absence of ocelli in the males is crucial, but on the other hand their absence may be due to the length of time in preservative. The nearest locality for *diolenius* (15 km E San Juan) lies some 120 km to the southeast of Hinche, and, although it is not at all improbable that this subspecies continues from the Valle de San Juan across the international boundary onto the Plateau Central in Haiti, more material from north-central Haiti may reveal the presence there of another subspecies of *S. difficilis*.

No intergrades between *diolenius* and the adjacent subspecies (*difficilis, peratus*) are known. The subspecies *difficilis* and *diolenius* approach each other at 7.5 mi NW Cruce de Pimentel and 1 km SE La Mata, a distance of 20 km, and *diolenius* and *peratus* occur at 1 km SE La Mata and 4 km N Azucey, a distance of 30 km. *S. d. diolenius* also occurs adjacent to *S. clenchi* and sympatrically with *S. savagei*; details of these contacts are discussed in the accounts of those species. *S. d. diolenius* is also sympatric with *S. cochranae* at the Bahía de San Lorenzo, where both species were taken in the Cuevas de Caño Hondo.

Specimens of *S. d. diolenius* have been taken in a variety of situations, including *Cocos* trash near shore and under isolated palm fronds on mud adjacent to a mangrove swamp, under the fallen thatch of an abandoned native hut, under palm fronds and trash on beach dunes and on sand flats behind dunes, under rocks and cacao trash, under a log in a limestone pasture, in rotting logs and under bark of fallen dead trees, under a log in mesic woods, under a thatch pile adjacent to a dry rice field, and in rock rubble and human debris on a cave floor along the edge of the cave wall. The lizards have been seen actively running about in the morning in the leaves on the floor of a mesic cacao grove. On three occasions, *S. d. diolenius* were taken in human dwellings. Altitudinal distribution is from sea level at many localities to an elevation of 415 meters at San Juan.

S. d. diolenius and *S. altavelensis enriquilloensis* are broadly sympatric and under special circumstances syntopic in the southwestern portion of the area occupied by *S. d. diolenius*. We have the impression that in this region, *diolenius* is an inhabitant of more shaded or mesic situations (although these locales may not be wet) than does the xerophilic *enriquilloensis*. East of Azua, both species were taken together in the same piles of old *Cocos* trash in a well shaded coconut grove—an artificial oasis in an otherwise hot and dry cactus-desert. Of the two species, *S. a. enriquilloensis* is much the smaller (males to 26 mm, females to 28 mm) than is *diolenius* (males 32 mm, females 33 mm). The scale counts overlap broadly, but in general *enriquilloensis* has lower dorsal, ventral, and midbody counts. In addition, *enriquilloensis* lacks a dark scapular patch, a feature reduced but only at times present in *diolenius*.

The short series from Isla Pascal in the Bahía de Samaná is referable to *diolenius* rather than to either *S. d. peratus* or *S. clenchi*. The low scale counts, and absent or very restricted scapular patch and paired ocelli in females confirm that these specimens

are assignable to *diolenius*. We are unable to locate Isla Pascal on any modern map but assume that it is close to the southern shore of the Bahía de Samaná, adjacent to the known range of *diolenius*.

Etymology.—The name *diolenius* is from the Greek for "with outstretched arms," in allusion to the wide distribution of this subspecies.

Sphaerodactylus difficilis anthracomus, new subspecies

Holotype.—CM 52279, an adult female, from 1 km NE Paraíso, Río Nizaíto, Barahona Province, República Dominicana, one of a series collected by James A. Rodgers, Jr., Albert Schwartz, and James B. Strong on 22 May 1969. Original number ASFS V16941.

Paratypes.—ASFS V16937–40, ASFS V16942–45, same data as holotype; ASFS V30438–41, same locality as holotype, 2 September 1971, J. R. Buffett, D. C. Fowler, A. Schwartz, B. R. Sheplan; USNM 167294–97, 2 km SE Barahona, Barahona Province, República Dominicana, 23 July 1963, D. C. Leber; LDO 7-5338–41, LDO 7-5364, 3 mi (4.8 km) S Barahona, Barahona Province, República Dominieana, 11 July 1968, J. B. Ober, L. D. Ober, R. A. Ober; ASFS V23422, 7 km SW Barahona, Barahona Province, República Dominicana, 4 January 1971, A. Schwartz; ASFS V20958, 5 km S, 1 km W Barahona, ±200 ft (61 m), Barahona Province, República Dominicana, 4 July 1969, R. Thomas; ASFS V31014–18, Barahona, southern outskirts, Barahona Province, República Dominicana, 12 September 1971, D. C. Fowler, B. R. Sheplan; ASFS V30451–62, 3.3 mi (5.3 km) NE La Ciénaga, Barahona Province, República Dominicana, 2 September 1971, native collectors; LSUMZ 21933–36, MCZ 119374–80, 9 mi (14.4 km) SW La Ciénaga, Barahona Province, República Dominicana, 22 July 1963, D. C. Leber, A. Schwartz, R. Thomas; AMNH 51466, Paraíso, Barahona Province, República Dominicana, 1932, W. G. Hassler; CM 52280–81, 2 km SW Paraíso, Barahona Province, República Dominicana, 1 August 1963, P. A. Adams, R. F. Klinikowski; ASFS V1451–52, 2 km SW Paraíso, Barahona Province, República Dominicana, hatched 25 September 1963 from eggs taken 1 August 1963; ASFS V1615, 2 km SW Paraíso, Barahona Province, República Dominicana, hatched 9 October 1963 from egg taken 1 August 1963; ASFS V30843–47, 1.9 mi (3.0 km) W Paraíso, 600 ft (183 m), Barahona Province, República Dominicana, 10 September 1971, D. C. Fowler, B. R. Sheplan; ASFS V35770, 3 km W Paraíso, 500 ft (153 m), Barahona Province, República Dominicana, 25 December 1972, M. D. Lavrich; ASFS V31019, 1.9 mi (3.0 km) W Paraíso, 600 ft (183 m), Barahona Province, República Dominicana, hatched 11 September 1971 from egg taken 10 September 1971; ASFS V30948–49, 4.1 mi (6.6 km) W Paraíso, 500 ft (153 m), Barahona Province, República Dominicana, 11 September 1971, D. C. Fowler; ASFS V30750–55, 0.5 mi (0.8 km) NE Caletón, 400 ft (122 m), Barahona Province, República Dominicana, 8 September 1971, D. C. Fowler, A. Schwartz, B. R. Sheplan; ASFS V30772–89, 1.5 mi (2.4 km) SW Caletón, 200 ft (61 m), Barahona Province, República Dominicana, 8 September 1971, D. C. Fowler, A. Sehwartz, B. R. Sheplan; LSUMZ 21932, 1.4 mi (2.2 km) NE Enriquillo, Barahona Province, República Dominicana, 11 July 1968, L. D. Ober.

Associated specimens.—República Dominicana: *Barahona Province,* 10 km SW Barahona (ASFS V40500); 3.3 mi (5.3 km) NE La Ciénaga (ASFS V39799–830, ASFS V39916–24); 6 km NE Paraíso (ASFS V39744–45, ASFS V39831–35); 6 km N Enriquillo, 366 m (ASFS V42166–67); 3 km N Enriquillo, 214 m (ASFS V42233); 5 km SW Enriquillo (ASFS V42388–89); 7 km SW, 0.5 km E Enriquillo (ASFS V42519–22); 7 km SW, 1 km E Enriquillo (ASFS V42491–500); 1 km SE La Lanza, 732 m (ASFS V45027). *Pedernales Province,* 0.5 km E Juancho (ASFS V42485–87).

Definition.—A subspecies of *S. difficilis* characterized by a combination of moderate number of dorsal scales (24–33) between axilla and groin, high number of midbody scales (45–56), female shoulder pattern consisting of a pair of pale ocelli and usually a very large dark scapular patch which is never barlike (Fig. 2H), and males with a pair of pale ocelli and the scapular patch at times indicated.

Distribution.—The eastern coast of the Península de Barahona, from the vicinity of Barahona on the north, south to near Juancho; generally confined to coastal situations or low elevations on the eastern slopes of the Sierra de Baoruco, but also occurring north of Enriquillo on the southern slopes of this range and near La Lanza in the uplands.

Description of holotype.—An adult female with a snout–vent length of 31 mm; tail length 22 mm, almost completely regenerated; dorsal scales axilla to groin 29, ventral scales axilla to groin 27, midbody scales 51, supralabials to mid-eye 3/3, 1 internasal, fourth toe lamellae 11, gular, chest, and ventral scales smooth.

Dorsal ground color brown, randomly flecked with black. Three cephalic lines dark brown on a buffy ground, the lines very distinct and the median line not touching the scapular figure posteriorly; scapular patch very large and black, with a pair of large distinct white ocelli laterally, the entire complex followed by a dark brown transverse line; ventrolateral stripes prominent and extending behind shoulder; venter fleshy gray, throat with very fine brownish stippling along jaw margins but otherwise unpatterned.

Variation.—Eighty-one *S. d. anthracomus* have the following measurements and scale counts: largest male (ASFS V30843) 33 mm, largest females (ASFS V30776, ASFS V30845) 32 mm; dorsal scales between axilla and groin 24–33 (28.7); ventral scales between axilla and groin 26–35 (30.1); midbody scales 45–56 (49.8); supralabials to mid-eye 3/3 (47),

3/4 (2); internasals 0 (12), 1 (66), 2 (2), 3 (1); fourth toe lamellae 8–12 (11.1; mode 11); gular scales usually smooth (73), very rarely keeled (1) or slightly keeled (7); escutcheon 4–8 (5.7) by 15–27 (21.0).

The dorsal coloration of males varies from very pale sandy to tan or dark brown or gray-tan, either without a dorsal pattern (LSUMZ 21934), or with a lightly flecked (LSUMZ 21933) or heavily flecked (ASFS V16937) dorsum. Paired white ocelli are regularly present and visible even in the palest males, and the scapular patch is usually absent; two males (LSUMZ 21934, USNM 167296) have a slightly darker area, which represents the patch in females between the ocelli. One peculiar individual (ASFS V30778) has the scapular patch as well developed as females, and there are remnants of a female head pattern; however, there is a moderately well developed escutcheon and the specimen appears, at least on this structural feature, to be a male. The trilineate head pattern persists in some large males (ASFS V16940, snout–vent length 28 mm), but even in such specimens there is a strong tendency for head dotting to obscure the basic female pattern. Head dotting is a common feature in most males, although it is absent in some fully adult specimens. The venter is whitish, pinkish gray, or dull orange, and the throat is either dotted with dark brown or not; both conditions occur with about equal frequency.

Females were recorded dorsally as tan to brown, with either little or no dorsal dark spotting or dotting (LDO 7-5338) or with fairly prominent but random dark flecks as in the holotype. The head pattern is unusually well defined and distinctive, the dark lines on a buffy ground color. The scapular patch is variably expressed, but in most females, especially in those from the type-locality and its vicinity, the patch is very large, dark brown, and regularly has two white ocelli along its lateral margins; there is often also a dark brown transverse line following the patch itself, as in the holotype. In specimens from Barahona and vicinity, the patch is somewhat more restricted but still evident, and the ocelli are large and conspicuous, even in pale individuals. The ventral coloration is whitish to fleshy gray, and the throat is concolor with the venter (not yellowish as in males) and rarely has a few scattered dark flecks. The iris color is yellow to golden yellow in both sexes.

Juveniles show the fullest expression of the female pattern, with large block-like scapular patches and associated white ocelli. Barahona juveniles have the patch less well expressed than do juveniles from farther south. One small specimen (ASFS V16944, snout–vent length 20 mm) has a widely opened pale chevron preceding the large scapular patch; this chevron is characteristic of juveniles and females of *S. randi* to the south. Juveniles have yellow throats and gray venters, and the underside of the tail is orange or coral red.

Comparisons.—In having a large and conspicuous scapular patch and two ocelli, female *S. d. anthracomus* are easily distinguished from females of those subspecies with one ocellus (*difficilis*) or with reduced scapular patches (*lycauges, typhlopous, peratus, diolenius*). From female *euopter,* which have a large scapular patch and two ocelli, female *anthracomus* differ in not being lineate orange dorsally. In having ocellate males, *anthracomus* differs from *difficilis, lycauges, typhlopous,* and *peratus.* Only *euopter* and *diolenius* males are ocellate, and males of the former have a well developed scapular patch. Male *diolenius* and *anthracomus* can be most easily distinguished by the absence of a lineate body pattern in the latter and its usual presence in the former.

In dorsal scales between axilla and groin, *anthracomus* has a higher mean than all discussed subspecies except *difficilis, typhlopous,* and *peratus.* In midbody scales, *anthracomus* has the highest mean of all discussed subspecies except *peratus*; the midbody mean of *anthracomus* (49.8 ± 0.78) differs significantly from those of *difficilis* (48.1 ± 0.71), *lycauges* (43.4 ± 0.62), *euopter* (45.3 ± 1.17), *typhlopous* (46.8 ± 1.51), *peratus* (51.8 ± 0.79), and *diolenius* (46.6 ± 0.33), but is closest to that of *difficilis.*

Remarks.—*S. d. anthracomus* is apparently a derivative of *S. d. diolenius.* Only in the extreme eastern, mesic end of the Valle de Neiba has *S. difficilis* been able to cross this xeric valley, with subsequent penetration onto the eastern coast of the Península de Barahona near sea level, and thence onto the southern portion of the Península itself in apparently especially favored situations. As has been repeatedly pointed out, the eastern littoral of the Península de Barahona is narrow, and the Sierra descends steeply to the ocean at many localities along this coast. Most specimens of *S. d. anthracomus* were taken in seaside situations—under palm trash in coastal groves, in a banana grove, under very dry palm thatch adjacent to an inhabited native house, under dry *Cocos* trash piles on sand behind mangroves, under palm trash in mesic woods, and (at the type-locality) in the wet fallen thatch of a shelter

along the lower reaches of the Río Nizaíto and under palm trash in a park-like grassy grove adjacent to the river bank. One lizard was taken as it was active in an abandoned schoolhouse in *Acacia* forest during the morning. The highest elevation for *anthracomus* is 2,400 ft (732 m) at La Lanza in the uplands of the Sierra de Baoruco.

Four eggs, taken 2 km SW Paraíso, had measurements of 7.9 by 5.4, 7.4 by 5.4, 7.4 by 5.5, and 7.6 by 5.3; three hatchlings from these eggs had snout–vent lengths of 14 and 15 mm.

It is possible that the specimens from the vicinity of Barahona represent a subspecies different from *anthracomus*; as pointed out above, these lizards are uniformly pale and females are unpatterned or weakly patterned dorsally. Likewise, the scapular patch is limited, although the ocelli are present and prominent. Another possibility is that these few geckos represent extreme intergrades between *diolenius* to the north and *anthracomus*. No certain intergrades between these two subspecies are known: *anthracomus* occurs at Barahona, whereas the nearest *diolenius* locality is Barreras, distant some 20 km airline and on the northern side of the Valle de Neiba. We have little doubt that *S. difficilis* occurs between these two localities, but specimens are lacking. The intervention of the large Bahía de Neiba between the Barahona and Barreras localities renders the distance of 20 km between them equivocal, since *S. difficilis* obviously must circumvent the bay in this region.

The Sierra de Baoruco and the Península de Barahona are complex as far as geographic interrelationships between members of the *difficilis* complex are concerned. Not only does *S. difficilis* itself occur widely along the eastern margin of the Península, but in these same lowlands occur *S. altavelensis* and *S. armstrongi; S. difficilis* has been taken syntopically with both these species—with *altavelensis* in the north and *armstrongi* in the south. At the type-locality of *S. d. anthracomus* and at other localities in this more mesic portion of the range of the Barahona subspecies, *anthracomus* is syntopic with *S. armstrongi*. The latter species is distinctly more mesophilic than *S. d. anthracomus* and seems to be associated with more upland areas in the Sierra de Baoruco. The two species are syntopic in those situations where the mesic upland flora and conditions descend to near the coast.

There are five species of sphaerodactyls which occur either syntopically or allotopically along the eastern margin of the Península de Barahona—*S. difficilis, S. randi, S. armstrongi, S. altavelensis,* and *S. streptophorus*. Of these, we have taken *difficilis* with *armstrongi, difficilis* with *altavelensis,* and *difficilis* with *streptophorus,* syntopically. Schwartz (1977) discussed the geographic relationships of these species and presented a map as well.

Of the four species, *S. d. anthracomus* is the largest with males reaching a snout–vent length of 33 mm, females 32 mm. All other local species are much smaller, with *S. a. enriquilloensis* the largest (males to 26 mm, females to 28 mm). *Sphaerodactylus d. anthracomus* and *S. a. armstrongi* are separable on the basis of dorsal scales (24–33 versus 29–41), whereas this count in *altavelensis* and *streptophorus* falls within the known parameters for *S. d. anthracomus*. At the species level, midbody scales in *S. armstrongi* are more numerous (49–64) than in *S. difficilis* (45–56) and midbody scales in *S. altavelensis* are less so (38–50), whereas midbody scales in *S. streptophorus* are comparable in number (41–60) to those of *S. difficilis*. Of the four species, only *S. d. anthracomus* has females with bold dark scapular patches with pale ocelli on a lighter ground; this condition stands most especially in contrast to that of *S. a. enriquilloensis* wherein the scapular patch is absent or, at its best expression, faint and weak. Both *S. armstrongi* and *S. streptophorus* lack scapular patches but have ocelli. The head patterns of all four species are so very distinctive that one has little difficulty assigning individual specimens to the proper taxon within this area of sympatry.

Etymology.—The name *anthracomus* is from the Greek for "charcoal" and "shoulder" in allusion to the large scapular patch in females.

Sphaerodactylus clenchi Shreve

Sphaerodactylus clenchi Shreve, 1968, Breviora, Mus. Comp. Zool., 280:21.

Definition.—A species of *Sphaerodactylus* with small, acute, strongly keeled, flattened, imbricate dorsal scales (Fig. 3) axilla to groin 33 to 48; no area of middorsal granules or granular scales; dorsal body scales with two to five hair-bearing organs, each with a single hair, around apex. Dorsal scales of tail keeled, acute, imbricate, and flat-lying; ventral scales of tail smooth, rounded, enlarged midventrally; gular scales smooth, but occasionally weakly to strongly keeled; ventral scales rounded, imbricate, axilla to groin 27 to 36, smooth; scales around midbody 53 to 71; internasals 0 to 3 (mode 1); upper labials to mid-eye 3 (rarely 4); escutcheon with a relatively narrow and compact central area and extensions onto thighs to near underside of knee (3–7 by 16–30).

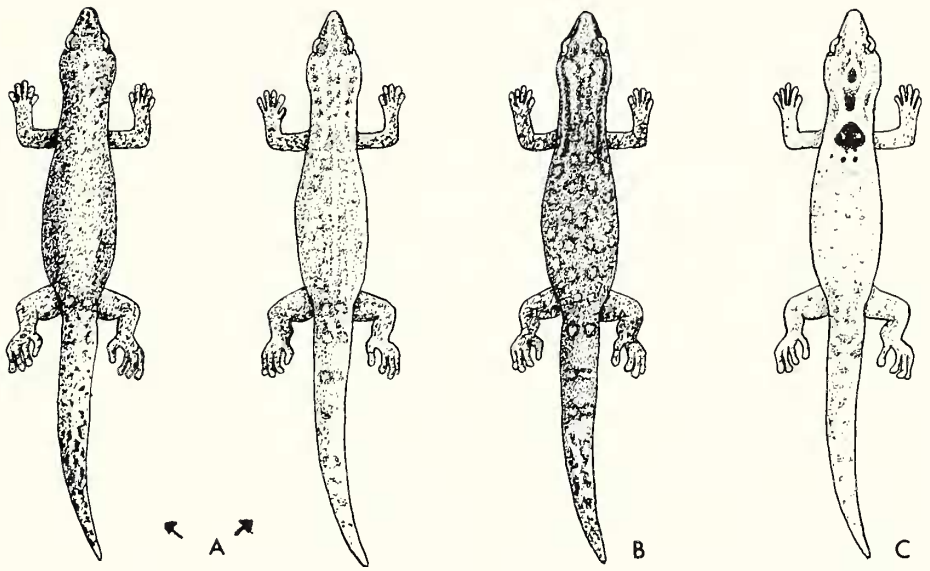

Fig. 3.—Dorsal views of *Sphaerodactylus clenchi* and *S. lazelli*, as follow: A) *S. c. clenchi* (male, ASFS V21847, and female, ASFS V1996); B) *S. c. apocoptus* (holotype female, USNM 166965); C) *S. lazelli* (holotype male, MCZ 63281).

Color pattern very weakly to moderately sexually dichromatic, and variable between the subspecies. Males yellowish tan to brown, with scattered dark brown flecks to dots and scattered creamy to orange ocelli giving a coarsely salt-and-pepper effect, no head pattern but top of head often with scattered dark brown flecks or dots, throats gray to yellow (not orange) with a dark reticulum or scattered dots or flecks; scapular patch and ocelli absent; venter grayish yellow or flesh. Females with same dorsal body pattern and color as males, but head either almost completely without pattern except for some vague darker spots, or with a quadrilineate pattern of which the two inner lines correspond to the widely separated edges of the median single line in *S. difficilis*; scapular patch and ocelli absent; ventral color as in males. Iris color yellow to orange.

Distribution.—República Dominicana, on the Península de Samaná as far as west of Sánchez, at Caba on the southwestern coast of the Bahía de Samaná, and on the eastern extremity of Hispaniola at Playa El Coco and near La Vacama, La Altagracia Province.

Sphaerodactylus clenchi clenchi Shreve

Sphaerodactylus clenchi Shreve, 1968, Breviora, Mus. Comp. Zool., 280:21.

Type-locality.—Samaná (= Santa Bárbara de Samaná), Samaná Province, República Dominicana.

Holotype.—MCZ 43706.

Definition.—A subspecies of *S. clenchi* characterized by a combination of high number of dorsal scales (34–48) between axilla and groin, high number (54–71) of midbody scales, and almost no sexual dichromatism in head pattern with females having only the barest indication of the more completely expressed head pattern in the following subspecies.

Distribution.—The Península de Samaná, west as far as 5.0 mi west of Sánchez, and at Caba at the southwestern corner of the Bahía de Samaná, República Dominicana (Fig. 4).

Variation.—The series of 97 *S. c. clenchi* has the following counts and measurements (means in parentheses): largest male (MCZ 43706) 33 mm snout–vent length, largest females (ASFS V34317, ASFS V34335, ASFS V34904, ASFS V34906, ASFS V36153) 32 mm; dorsal scales between axilla and groin 34–48 (40.7); ventral scales between axilla and groin 27–36 (31.7); midbody scales 54–71 (61.4); supralabials to mid-eye 3/3 (62 individuals), 3/4 (1); internasals 0 (1 individual), 1 (83), 2 (11), 3 (2); fourth toe lamellae 7–14 (11.8; mode 13); throat scales usually smooth (82 individuals) but at times keeled (4) or partially keeled (11); escutcheon 3–7 (5.0) by 16–30 (22.4).

Males are brown, dark brown, tan, or yellowish tan with scattered dark brown flecks, giving a finely salt-and-pepper effect; these dark flecks often alternate (especially along the sides) with much larger dull orange ocelli; these ocelli occasionally (ASFS V21859) fuse to form a ventrolateral line above the

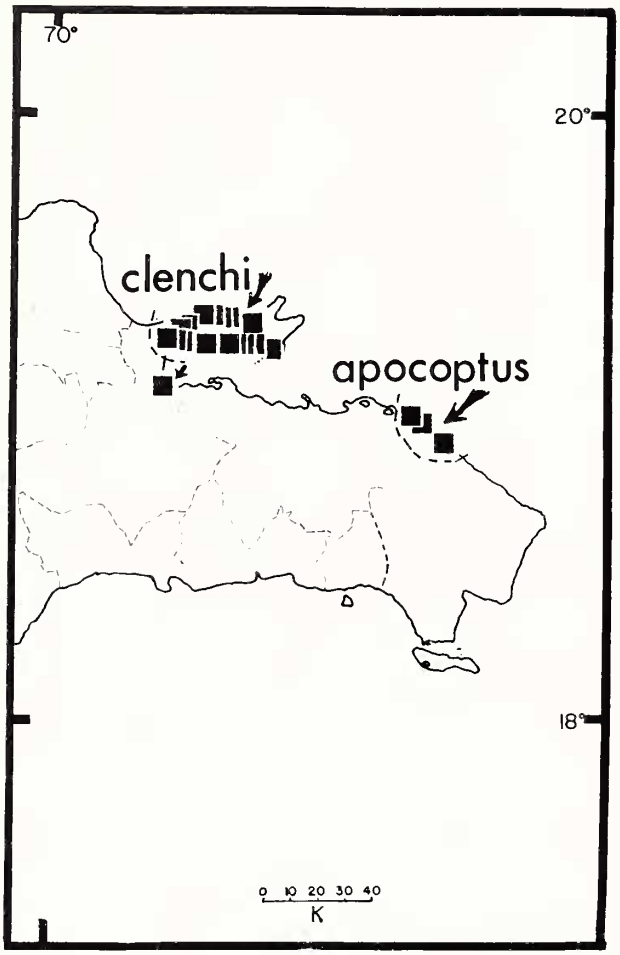

Fig. 4.—Map of extreme eastern Hispaniola, showing the distributions of two subspecies of *Sphaerodactylus clenchi.*

forelimb insertion on each side (Fig. 3A). The top of the head is either unicolor (at times with a yellow wash) with the dorsum and unpatterned, or there may be heavy dark brown flecks, dots, or mottling over the top of the head and including the snout. One male (ASFS V1995) shows the vaguest remnants of the female head pattern. The venter is grayish yellow; the throat ground color is yellowish gray to yellow, and there is a heavy pattern of dark brown (either dots or a reticulum). The iris is rarely yellow to usually bright orange, and the underside of the tail is orange. The upper side of the tail is marked with transversely juxtaposed orange to buffy ocelli giving, at least basally, a more or less crossbarred appearance; a pair of orange ocelli occurs fairly regularly at the base of the tail.

Females are colored and patterned dorsally like the males, even to the dotted head pattern. Young females, however, as well as juveniles, often show the vaguest indications of a quadrilineate head pattern, much better expressed in females of the other subspecies, which is represented by solid dark brown flecks arranged along the positions of the four lines (Fig. 3A). The venters of females were recorded as yellow-orange, and the throats are patterned with some scattered brownish to dark gray dots or flecks, less bold than in males. The ocellate tails of females are like those of males.

Juveniles are patterned like adults, and there is little ontogenetic change in pattern with increased size, since many small juveniles have the heads with scattered dark spots.

Mertens (1939:43) described a single male from Samaná as "Schuppen sehr klein; . . . Hellgrau mit vielen dunkelgrauen Flecken, die kaum deutliche Langsreihen bilden. Keine hellen Abzeichen auf den Schultern oder am Schwanzende." Shreve (1968:21) considered that *S. clenchi* was most closely related to *S. caicosensis* Cochran from the Caicos Bank islands, but it seems more likely that *S. clenchi* is a derivative of *S. difficilis* (see beyond).

Remarks.—*S. c. clenchi* is common on the Península de Samaná. Our specimens were secured in palm trash in mesic *Cocos* groves, in a small, old, and very decayed pile of palm trash about 3 m from the inner edge of the mangrove border in a dense growth of herbaceous halophytes, under palm trash in an open and grassy *Cocos* grove, and under palm fronds behind *Coccoloba* on a sandy beach. At the other extreme are specimens from the Sierra de Samaná at an elevation of 1,000 ft (305 m) and in a mesic but somewhat lower *cacaotal.* The Sierra de Samaná locality is in high-canopy hardwood forest with some cultivation.

Specific status for *S. clenchi* depends primarily upon the higher scale counts of *S. c. clenchi,* the lack of or different head pattern in females (as compared with those of *S. difficilis*), and the apparent sympatry of *S. clenchi* and *S. difficilis* at Sánchez near the isthmus of the Península de Samaná. The precise situation at Sánchez requires confirmation. In a 12 day stay at Sánchez, Schwartz and Buffett secured only *S. clenchi,* even as far distant as 5 mi (8 km) northwest of that settlement (and thus toward the isthmus). They were unable to secure any sphaerodactyls between this locality and Caño Abajo (which lies on the mainland at the western extreme of the isthmus) where all material was *S. difficilis.* Thus the supposed sympatry remains unconfirmed; because it is based exclusively upon old specimens

Table 1.—*Meristic data on seven subspecies of* Sphaerodactylus diffieilis *and two of* S. clenchi*; extremes and means are given of selected counts except in* S. lazelli *where only one specimen is known. Diagnostic characters of the seven subspecies of* S. difficilis *(both sexes) as far as the shoulder pattern is concerned are likewise given briefly.*

Taxon	N	Dorsals axilla-groin	Ventrals axilla-groin	Midbody scales	Male pattern	Female pattern
S. d. difficilis	65	25–34 (29.2)	24–37 (30.2)	42–55 (48.1)	patch and ocelli absent	1 ocellus small patch
S. d. lycauges	119	22–33 (26.4)	24–35 (28.7)	37–50 (43.4)	ocelli and patch usually absent, but ocelli indicated	2 ocelli small patch
S. d. euopter	30	24–31 (27.8)	23–31 (26.7)	41–50 (45.3)	patch and ocelli present	2 ocelli large patch; dorsum with orange lines
S. d. typhlopous	85	25–35 (30.3)	24–36 (30.0)	41–53 (46.8)	ocelli and patch absent	patch and ocelli absent to barely present
S. d. peratus	83	28–40 (34.0)	26–35 (29.4)	46–60 (51.8)	ocelli and patch absent	patch absent to bar-like 2 ocelli
S. d. diolenius	446	23–35 (28.0)	24–37 (29.8)	40–53 (46.6)	ocelli usually present; patch absent	ocelli present, patch absent to bar-like
S. d. anthracomus	81	24–33 (28.7)	26–35 (30.1)	45–56 (49.8)	ocelli usually present; patch absent	ocelli large, bold; patch variable usually large, never bar-like
S. c. clenchi	97	34–48 (40.7)	27–36 (31.7)	54–71 (61.4)		
S. c. apocoptus	60	33–43 (37.2)	27–36 (31.1)	53–63 (57.8)		
S. lazelli	1	20	25	42		

whose locality data may be imprecise, we are not convinced that *S. difficilis* occurs on the Península de Samaná. The higher scale counts in *S. c. clenchi* versus those of *S. difficilis* are verified by our study, but it should be recalled that *S. d. peratus,* that subspecies of *S. difficilis* which occurs in the northeastern República Dominicana, has the highest scale counts (midbody 46–60) of all the *difficilis* subspecies (in contrast to midbody counts of 54–71 in *S. c. clenchi*). It might be more proper to consider *S. clenchi* as a subspecies of *S. difficilis* (because unequivocal sympatry remains unknown), but the occurrence of the species to the east on the southern side of the Bahía de Samaná, where it is readily distinguishable from and allopatric to adjacent *S. d. diolenius,* suggests strongly that the species are quite distinct.

Because of the general resemblance between *S. clenchi* and *S. difficilis,* there seems to be no reason to postulate a close relationship between *S. clenchi* and *S. caicosensis* as Shreve has done. The latter is a distinctly sexually dichromatic species with unicolor and non-ocellate males, and transversely crossbanded females—two pattern conditions which are quite different from the ocellate and salt-and-pepper patterns in *S. clenchi* (see Schwartz, 1968: 247 *et seq.*, for details of variation in *S. caicosensis*).

The large Río Yuna empties into the head of the Bahía de Samaná. The short series of *S. c. clenchi* from Caba on the south side of the Bahía presents a minor problem of distribution. Caba is a small fishing village lying on a pair of tiny beaches at the foot of the *haitises* which, on the southwestern portion of the Bahía de Samaná, come abruptly to the coast. Between Caba and the nearest northern locality for *S. c. clenchi* (Sánchez), lie the extensive swamps of the mouth of the Yuna. Although *S. clenchi* is a mesophile, it seems hardly likely that the species occupies these intermediate swampy regions. On the other hand, the specimens from Caba were all taken within and near the settlement; Caba residents sell their products and make purchases weekly in Sánchez, and it may well be that the Caba *S. clenchi* population has been fortuitously established through human agency. There are no other *Sphaerodactylus* known from the interior *haitises* (with the exception of *S. darlingtoni* near Gonzalo) and none from farther east along this coast until the Bahía de San Lorenzo, west of Sabana de la Mar, where four species (*difficilis, darlingtoni, cochranae,*

samanensis) are sympatric. I once more reiterate that the karst *haitises* region of northeastern República Dominicana is one of the herpetologically least known areas of the República Dominicana, and extensive work is demanded in that difficult area before the geographic relationships of these four geckos can be understood.

Specimens examined.—República Dominicana: *Samaná Province,* 5.0 mi (8.0 km) NW Sánchez (ASFS V34332–37, ASFS V34942); Sánchez (MCZ 43706); 2.2 km E Sánchez (ASFS V14118–19); 14 km E Sánchez (ASFS V2011–12); 4.5 mi (7.2 km) E Sánchez (ASFS V34174); 7.6 mi (12.2 km) NE Sánchez, 1,000 ft (305 m) (ASFS V34307–21, ASFS V34896–914); 5 km E Las Terrenas (ASFS V21847); 7 km E Las Terrenas (ASFS V21858–71); 3.8 mi (6.1 km) E Las Terrenas (ASFS V34125); 0.3 mi (0.5 km) NW El Limón (ASFS V36151–54); 5.1 mi (8.2 km) NW El Limón (ASFS V36155–58, ASFS V36163); ca. 2 km W Los Cacaos (ASFS V21932); 8 km W Samaná (ASFS V1994–V2002); 6 km W Samaná (ASFS V1973–74, ASFS V14131–36); 4 km W Samaná (ASFS V14124); Samaná (MCZ 43706—holotype); Puerto Escondido (ASFS V2978); Caba (ASFS V36075–79).

Sphaerodactylus clenchi apocoptus, new subspecies

Holotype.—USNM 166965, an adult female, from Playa El Coco, 46 km N Higüey, La Altagracia Province, República Dominicana, one of a series collected by James A. Rodgers, Jr., and James B. Strong on 13 June 1969. Original number ASFS V17540.

Paratypes.—ASFS V17521–25, ASFS V17536–39, ASFS V17552–55, MCZ 119351–58, CM 45895–900, USNM 167252–57, LSUMZ 21896–902, same data as holotype; ASFS V29020–36, 2.6 mi (4.2 km) NE La Vacama, La Altagracia Province, República Dominicana, D. C. Fowler, A. Schwartz, native collectors, 22 July 1971; ASFS V29039, 5.7 mi (9.1 km) SE La Vacama, La Altagracia Province, República Dominieana, D. C. Fowler, 22 July 1971.

Definition.—A subspecies of *S. clenchi* characterized by a combination of low number of dorsal scales (33–43) between axilla and groin, low number (53–63) of midbody scales, and sexually dichromatie in that females have a quadrilineate head pattern (Fig. 3B), whereas males have the head concolor with (or more yellowish than) the dorsum, either unpatterned or with scattered dark brown spots or flecks.

Distribution.—Known only from three coastal or near-coastal localities on the eastern extremity of Hispaniola in La Altagracia Province, República Dominicana.

Description of holotype.—An adult female with a snout–vent length of 31 mm, tail length 25 mm, distal half regenerated; dorsal seales axilla to groin 36, ventral scales axilla to groin 33, midbody scales 59, supralabials to mid-eye 3/3, 1 internasal, fourth toe lamellae 11, gular scales keeled, chest and ventral scales smooth.

Dorsal ground color brown with scattered darker brown flecks alternating in a random fashion with large creamy ocelli outlined in dark brown; head pattern consisting of four longitudinal lines of which the outer pair begins on the snout, passes through the eye, across the temples and thence above the forelimb insertion onto the anterior trunk, this entire line outlined below by a creamy longitudinal line; median head lines consisting of (apparently) the outer and more widely separated dark edges of the *S. difficilis* median head line, beginning as a pair of narrow lines on the snout, becoming less conspicuous in the interocular region, having a lyre-shaped configuration in the postocular region, and progressing as a pair of well defined lines onto the neck; limbs and tail brown, marked with buffy ocelli or crossbars on the limbs and paired dark-edged ocelli on the tail (unregenerated portion); venter and throat flesh, throat with scattered brown flecks; iris orange.

Variation.—Sixty *S. c. apocoptus* have the following measurements and counts: largest male (ASFS V17522) 31 mm snout–vent length, largest females (holotype, USNM 166965) 31 mm; dorsal scales between axilla and groin 33–43 (37.2); ventral scales between axilla and groin 27–36 (31.1); midbody scales 53–63 (57.8); supralabials to mid-eye 3/3 (40), 3/4 (1), 4/4 (2); internasals 0 (1 individual), 1 (58), 2 (1); fourth toe lamellae 9–14 (11.3; mode 12); throat scales usually smooth (44 individuals), but at times keeled (8) or weakly keeled (8); escutcheon 3–7 (4.5) by 16–27 (23.0).

Males are yellowish tan to brown dorsally, flecked with dark brown, often with scattered creamy ocelli; head unicolor with the dorsum (or washed with yellowish) and at times with a few scattered dark brown flecks or dots, the dark spots generally aligned along the female quadrilineate head pattern. The bellies are flesh to yellow, and the throats are yellowish with scattered dark gray dots or spots, never with a reticulum. Unregenerated tails have creamy ocelli arranged in pairs to give a cross-barred appearance. The iris color is orange (rarely) to yellow.

Females are like the males dorsally (except that the heads are not yellowish), although there is a tendency for the former sex to be more prominently ocellate with creamy ocelli. The head pattern is as deseribed for the holotype, although some females tend toward an obliteration of the two median lines. The pale longitudinal lines paralleling the lateral

pair of dark lines below is a common and easily discernible feature. The ventral color is like that of males, but the throats are not yellow and have scattered gray flecks or dots.

Juveniles are unicolor brown with some dark flecking. The juvenile head pattern is like that of females, and there may be some emphasis of the pattern by line-following dark brown dots.

Comparisons.—In all body counts, *S. c. apocoptus* averages less than nominate *S. clenchi*. The midbody means of 61.4 ± 1.1 in *clenchi* and 57.8 ± 0.8 in *apocoptus* are statistically different. The two subspecies are also easily distinguishable in pattern. Male *clenchi* have heavily reticulate or spotted or dotted throats, whereas those of male *apocoptus* are not reticulate but are usually marked by discrete gray spots. There is a tendency for male *clenchi* to have the top of the head spotted with dark brown, whereas the head is rarely so densely marked in male *apocoptus*. Females of the two subspecies are very easily distinguished; female *clenchi* have the quadrilineate head pattern very reduced or absent, whereas the pattern is fully and boldly expressed in female *apocoptus*. Although both subspecies have yellow to orange irides, those of *clenchi* are usually orange and those of *apocoptus* usually yellow.

S. c. apocoptus is not known to be sympatric with any other *Sphaerodactylus*; in fact, the range of the subspecies as presently known lies between that of *S. d. diolenius* on the west (nearest locality, 20.2 mi NW, 3.4 mi N La Vacama, El Seibo Province, 25 km to the west) and of *S. savagei* on the east (nearest locality, 0.1 mi SE El Macao, La Altagracia Province, 15 km to the east); to the south also occurs *S. d. diolenius* (7 mi W El Cuey, El Seibo Province; 30 km). Of the three eastern Dominican species of *Sphaerodactylus*, sympatry is not surely known between *difficilis* and *clenchi* and is unknown between *clenchi* and *savagei*; the precise geographical interrelationships of these species in this region are subject to further study. Sympatry between *difficilis* and *savagei* is known only at the type-locality of the latter La Romana).

Remarks.—The range of *S. c. apocoptus* lies about 55 km southeast of the main center of *S. clenchi* (on the Península de Samaná). The original series was collected by Rodgers and Strong in a coastal *Cocos* grove under palm trash, and the series collected subsequently by Fowler and Schwartz was in the same precise situation. The single male from southeast of La Vacama was taken during the early afternoon on the trunk of a *Musa* in an open and rather mesic *Musa-Coffea* grove. In general, the southern shore of the Bahía de Samaná between Miches and El Macao is difficult of access, since no roads proceed along it; this doubtless accounts for the fact that *S. c. apocoptus* has not been previously taken in this region. Interestingly, coastal *Cocos* groves between Miches and El Macao yield only one of the three species involved in this region—*difficilis, clenchi,* or *savagei*—and we were unable to secure any two species syntopically. There are no major geographic barriers to account for this peculiar situation. However, the Río Nisibón lies between the ranges of *difficilis* and *clenchi,* and the Río Maimón and the Río Anamuya lie between the ranges of *clenchi* and *savagei*. Whether these rivers are major and real barriers for these three species remains to be determined.

If *S. c. apocoptus* is syntopic with either *S. difficilis* or *S. savagei,* the species can be easily distinguished: in *apocoptus* there are 53 to 63 midbody scales, in local *savagei* 37 to 49 midbody scales, and in local *difficilis* 40 to 53 midbody scales. The head and body patterns of the three species are quite different, and specimens are not easily confounded.

Etymology.—The name *apocoptus* is from the Greek meaning "cut off," in allusion to the remote geographical position of the subspecies in relation to *S. c. clenchi*.

Sphaerodactylus lazelli Shreve

Sphaerodactylus lazelli Shreve, 1968, Breviora, Mus. Comp. Zool., 280:8.

Type-locality.—Cap-Haïtien (under bark of tree in shady gully), Département du Nord, Haiti.

Holotype.—MCZ 63218.

Distribution.—Known only from the type-locality (Fig. 1).

Definition.—A species of *Sphaerodactylus* with large, acute, strongly keeled, flattened, imbricate dorsal scales, axilla to groin 20 in only known specimen; no area of middorsal granules or granular scales; dorsal body scales with seven or eight hair-bearing organs, each with one or two hairs, around apex. Dorsal scales of tail keeled, acute, imbricate, and flat-lying; ventral scales of tail smooth, rounded, enlarged midventrally; gular scales keeled, chest and ventral scales smooth; ventral scales rounded, imbricate, axilla to groin 25, smooth; scales around midbody 42; internasal 1; upper labials to mid-eye 3/3; escutcheon with a broad and compact central area and extensions onto thighs to near underside of knee (6 by 29).

Male (only sex known; color from preserved specimen) medium brown above with a very few scattered darker brown scales arranged in a more or less lineate pattern; a large prominent and sharp-edged black scapular patch with two included tan ocelli, followed by a transverse series of three tiny black dots in the position of three of the vague dorsal lines formed by the darker dorsal scales; a large black sharp-edged elongate spot on the neck and another, ovate, on the occiput, the former with a pair of fine dark lines extending from its anterolateral corners to pass around the occipital spot and end between the eyes; a clear tan postocular line which joins its mate posterior to the nuchal blotch to give a moderately well defined pale U-shaped figure on the head and neck (Fig. 3C); tail not ocellate; venter immaculate pale tan with some scattered dark brown flecks along the ventrolateral margins.

Remarks.—In addition to the scale counts given in the definition, the holotype of *S. lazelli* has 12 fourth toe lamellae, a snout–vent length of 31 mm, and a tail length of 30 mm.

S. lazelli is a very distinctive form, if for no other reason than the head pattern which is strikingly different from the style of *S. difficilis* or of that of any other member of the *difficilis* complex. Presumably *S. lazelli* is sympatric with *S. d. lycauges* (of which there is abundant material from Cap-Haïtien), but the two species differ in head pattern since *lycauges* males lack the U-shaped figure, large black scapular patch and ocelli, and occipital and nuchal spots of *lazelli*. As far as scales are concerned, *lazelli* lies below *lycauges* in dorsal scales between axilla and groin (20 versus 22 to 33), but counts of ventral and midbody scales of *lazelli* are included within the observed variation of these counts in *lycauges*. The width of the escutcheon in *lazelli* (29) is greater than that of male *lycauges* (10–24). The distinctly keeled throat scales in *lazelli* aid in separating the species from local *S. difficilis*; however, four of 105 *S. d. lycauges* have the throat scales equally as keeled.

There is no reason to doubt that *S. lazelli* is a satellite species derived from *S. difficilis*; in having the black scapular patch and ocelli, *lazelli* apparently has fully retained a juvenile (and female) pattern feature into adult males, a condition few *S. difficilis* have done. Presumably, the species will be found widely distributed along this mesic northern Haitian coastal region, but many man-weeks of search, with the aid of many Haitians, has failed to turn up a second specimen.

Specimen examined.—Haiti: *Dépt. du Nord,* Cap-Haïtien (MCZ 63218—holotype).

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PART 2. *SPHAERODACTYLUS SAVAGEI, S. COCHRANAE, S. DARLINGTONI, S. ARMSTRONGI, S. STREPTOPHORUS,* AND CONCLUSIONS

RICHARD THOMAS AND ALBERT SCHWARTZ

ABSTRACT

Four species of Hispaniolan geckos of the *difficilis* complex are discussed in detail, and a new subspecies of a fifth (*S. streptophorus*) is also named. *Sphaerodactylus savagei* has two weakly differentiated subspecies in extreme eastern Hispaniola, and *S. cochranae* is monotypic and is known from a very limited amount of material and from a circumscribed area in eastern Hispaniola. *Sphaerodactylus armstrongi* occurs on the Hispaniolan south island in Haiti and the República Dominicana and has two subspecies, whereas *S. darlingtoni* occurs on the Hispaniolan north island and has three subspecics, all in the República Dominicana. A phyletic schema of the relationships of all known members of the *difficilis* complex is presented.

INTRODUCTION

The present paper continues the discussion of the variation of Hispaniolan members of the *difficilis* complex (see Part 1), and further attempts to show phyletic trends within the entire group of these geckos on Hispaniola.

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SYSTEMATIC ACCOUNTS

Sphaerodactylus savagei Shreve

Sphaerodactylus notatus savagei Shreve, 1968, Breviora, Mus. Comp. Zool., 280:7.
Sphaerodactylus savagei: Schwartz and Thomas, 1975:161.

Definition.—A species of *Sphaerodactylus* with large, acute, strongly keeled, flattened, imbricate dorsal scales, axilla to groin 20 to 31; no area of middorsal granules or granular scales; dorsal body scales with seven to twelve hair-bearing organs, each with one hair, around apex. Dorsal scales of tail keeled, acute, imbricate, and flat-lying; ventral scales of tail smooth, rounded, only slightly enlarged midventrally; throat, chest, and ventral scales always entirely smooth; ventrals rounded, imbricate, axilla to groin 25–38; scales around midbody 34–50; internasals 0–2 (mode 1); upper labials to mid-eye 3/3 (occasionally 3/4 or 4/4); escutcheon small and patchlike, without extensions far along the thighs to knees (3–6 by 5–17).

Color pattern sexually dichromatic. Males some shade of tan (yellowish to purplish) or gray, to brown with scattered dark brown to black scales giving a strongly and randomly salt-and-pepper effect which, because of the generally pale ground color, often gives a strikingly contrasting appearance (Fig. 2B); head ground color yellow, usually overlaid by large irregular dark brown to black spots with cream frosting between them; a pair of white to buffy scapular ocelli interconnected by a dark brown bar or dash; throats grayish, pale yellow, to bright orange, immaculate to heavily spotted with dark brown, the variation correlated with the amount of dorsal head spotting; venter pink to dark gray. Females with dorsal color like males, but ground color greatly obscured by the irregular dark brown to black markings, at times coarsely salt-and-pepper (Fig. 2A), at times quinquelineate, at times with the dark pigment organized into about five or six transverse bands (Fig. 2C), with scattered buffy to cream scales between the dark markings; head and scapular pattern extremely variable, but basically consisting of a pair of faint white to buffy ocelli in a clear area surrounded on all sides by a large rectangular dark brown to black spot, the anterior (preocellar) portion

of the spot joining anteriorly with a dark postocular stripe; a vague postocular median dark stripe which is variable in expression and intensity and often restricted to a diffuse dark occipital blotch; ventral color like males except at times pale yellow; throat concolor with venter, usually immaculate, at most with some grayish lateral diagonal streaking. Iris golden yellow to yellow.

Distribution.—República Dominicana, coastal areas of La Altagracia and La Romana provinces, from El Macao on the north, around Cabo Engaño to La Romana on the south; inland as far as near San Rafael del Yuma; Isla Saona; Isla Catalinita; an apparently isolated population from near Sabana Grande de Palenque, San Cristóbal Province.

Sphaerodactylus savagei savagei Shreve

Sphaerodactylus notatus savagei Shreve, 1968, Breviora, Mus. Comp. Zool., 280:7.

Sphaerodactylus savagei savagei: Schwartz and Thomas, 1975: 161.

Type-locality.—La Romana, La Romana Province, República Dominicana.

Holotype.—California Academy of Sciences-Stanford University 14695.

Definition.—A subspecies of *S. savagei* characterized by a combination of slightly higher mean number (34–50) of midbody scales, and female pattern without dark crossbands and with either a dark salt-and-pepper pattern or a pattern of five longitudinal dark lines on a pale ground; pale ocelli variably present in both males and females.

Distribution.—The southeastern coast of the República Dominicana, from La Romana in the west, east to the east side of the Río Chavón, in La Romana and La Altagracia provinces (Fig. 1).

Variation.—The series of 103 *S. s. savagei* has the following counts and measurements (means in parentheses); largest males (ASFS V35002, ASFS V35006-07, ASFS V35009, ASFS V35019) 32 mm snout–vent length, largest females (ASFS V35016, ASFS V35028, ASFS V35032) 32 mm; dorsal scales between axilla and groin 20–31 (26.1); ventral scales between axilla and groin 26–38 (30.6); midbody scales 34–50 (44.3); supralabials to mid-eye 3/3 (69 specimens); internasals 0 (2 individuals), 1 (101); fourth toe lamellae 7–13 (10.4; mode 11); gular, chest, and ventral scales always smooth; escutcheon 3–6 (4.5) by 6–17 (12.3).

Shreve (1968:7–8), in naming both *savagei* and *juanilloensis* (which, together, comprise a species distinct from *S. difficilis*; see discussion beyond), examined a total of 28 specimens, whereas we have had access to 260 lizards. The two taxa, *savagei* and *juanilloensis,* were partially diagnosed on the basis of the dorsal coloration (= pattern). Although there are some differences between these two taxa in dorsal pattern, both are so variable in their own right that it is difficult to distinguish individuals; in series, however, the differences in dorsal pattern are appreciable. Accordingly, despite our original impressions that *savagei* and *juanilloensis* were not distinct, we herein maintain both taxa but feel strongly that the differences between them are not so obvious as are those between, say, the subspecies of *S. difficilis* or *S. clenchi.*

Male *S. s. savagei* are brown to pale lavender dorsally with a fairly dense salt-and-pepper pattern of darker brown to black spots, these spots continuous onto the head which may have an inter-spot white frosting. Two white ocelli are variably present; if present, they may be isolated or may have a small dark bar between them. There is never a large black scapular patch. Tails are reddish brown to pale cream dorsally, the upper surfaces with a continuation of the dorsal salt-and-pepper pattern. The venter is pink to dark gray, and the throat varies between immaculate to having a heavy black reticulum or isolated circular dots; the throat ground color varies between pale yellow and grayish. Some males (ASFS V35003) have the dorsal dark spots aligned into three or five longitudinal series of markings, typical of some females of *S. s. savagei.*

The dorsal ground color of females is tan to brown and there is a trilineate head pattern. The head and neck pattern is complex and is best discussed by first describing the most complete pattern available, that of a female from Isla Saona (ASFS V3044; see Fig. 2C). This individual is not assigned to the nominate subspecies, but it shows the head pattern most vividly and may be used as a standard for comparisons of the pattern of *savagei* versus that of *juanilloensis.* In this female, there is a pair of small and inconspicuous pale (buffy to white) ocelli lying in a small patch of dorsal ground color enclosed *within* a dark brown scapular rectangle. The anterior corners of the rectangle are more or less connected to a pair of dark lines which begin on the lores, cross the eyes, extend across the temples, and contact the dark rectangle. There is a vague postocular median dark stripe, often interrupted to form an interocular spot and an occipital spot. The snout is variously mottled or stippled with dark, and there is no indication of a median snout line.

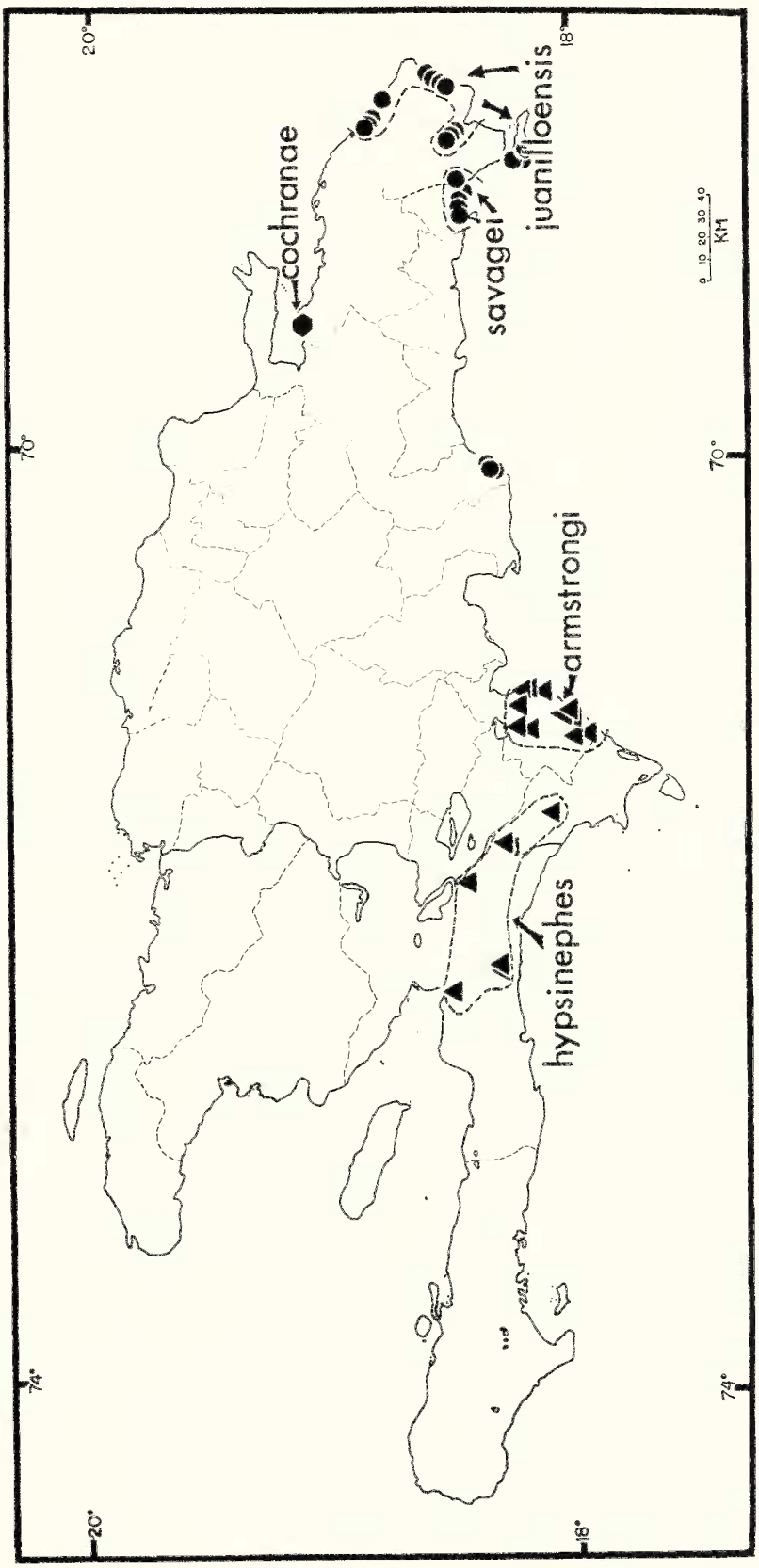

Fig. 1.—Map of Hispaniola showing the ranges of three species of *Sphaerodactylus* as follow: *S. savagei*, circles; *S. cochranae*, hexagon; *S. armstrongi*, triangles. The known ranges of the two subspecies of *S. savagei* are indicated and the disjunct population of this species in San Cristóbal Province to the west is shown. The two subspecies of *S. armstrongi* are indicated.

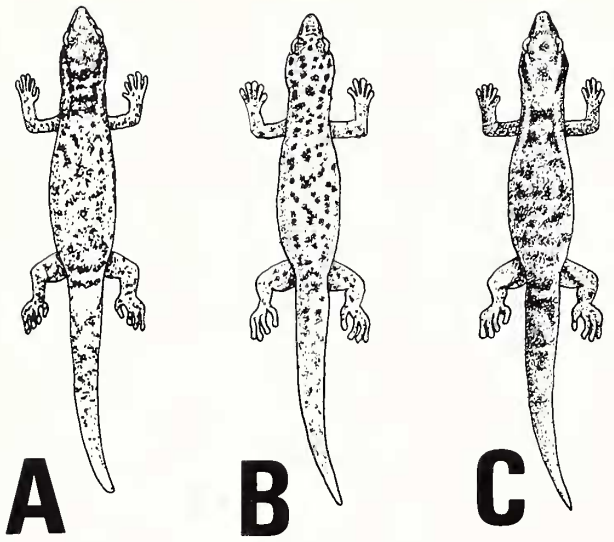

Fig. 2.—Dorsal views of *Sphaerodactylus savagei,* as follow: A) *S. s. savagei,* female (ASFS X9296); B) *S. s. juanilloensis,* male (ASFS V16255); C) *S. s. juanilloensis,* female (ASFS V3044).

The above description serves fairly well to denote the head and neck pattern of female *S. s. savagei,* but there are many modifications of this basic pattern. The ocelli are variably present and may lie, instead of within a clear area, in a dark transverse bar comparable to that in males. The head lines may be complete or virtually so, and well indicated, or they may be fragmented or very obscure. In many females, the top of the head and neck have a large, pale, grossly U-shaped cephalic figure, without interior markings. The variants seem almost endless, and it is pointless to discuss all permutations of the basic pattern described above. Perhaps the most constant feature is the pale ocelli, but even these are often absent.

The female dorsal body pattern is likewise variable, but can be categorized into two sorts. Some females are salt-and-pepper like males, although the dark scales may be less contrasting than are those of males. A second group of females is distinctly quinquelineate dorsally. In addition to the dark dorsal markings, there are often scattered paler buffy or white scales, especially on the upper eyelids. The venter varies from pale yellow to pinkish gray or gray. The tails are often very distinctly marked, with a pair of buffy ocelli at the base of the tail and a series of paired buffy ocelli, at times fused into complete crossbands, on the tail. The throat is concolor with the venter and usually unmarked; at best there are some lateral diagonal grayish gular lines. The iris is yellow to gold in both sexes.

Juveniles show the female pattern but with additional intensity. The variation shown in adult females is duplicated in juveniles, however, and the ocelli and scapular pattern are variably expressed. Those juveniles which are salt-and-pepper are less densely so than adults of both sexes. The tail ground color is straw to orange and, as in females, there may be series of paired caudal ocelli.

Grant (1952:187, pl. I) presented a photograph of four adult females, three adult males, and seven juveniles from La Romana (and thus topotypes of *S. s. savagei*). Some of the features noted above for this subspecies are clearly demonstrated in the photograph (the boldly crossbanded tails in females, for instance), but his series on the other hand does not show features such as the longitudinally lined females nor the strong sexual dichromatism in pattern. Also, the juveniles all appear to be crossbanded, a condition which is never so clearly indicated in our much longer series of 34 juveniles. This is all the more remarkable since the thesis of Grant's paper was the ontogenetic change from crossbanded juveniles to spotted adults. The situation is inexplicable.

Remarks.—The long series (ASFS V35001-70) of *S. s. savagei* was secured by Fowler and Sheplan in a pile of lumber-trash in a hotel patio; two *S. d. diolenius* were also taken in the same pile. Other *S. s. savagei* were secured in piles of papers at the abandoned office of the sugar mill in central La Romana, and one was secured behind a picture in the corridor of another hotel in La Romana. Outside of the city, the geckos have been collected in palm trash on the beach and in semixeric woods (mouth of Río Chavón), under old dry piles of *Cocos* trash in xeric scrub on sandy soil (8 km E La Romana), and under a rock in a dry pasture (2 km E La Romana). All these natural situations are xeric. On the other hand, the single specimen from east of the Río Chavón was taken under a rock in mesic woods on a limestone ridge. At this locality, a *Tropidophis haetianus* regurgitated a *S. savagei.*

We already commented upon the syntopy of *S. s. savagei* and *S. d. diolenius* at La Romana. Shreve, in differentiating "*Sphaerodactylus notatus savagei*" from other related *difficilis*-group sphaerodactyls, correctly stressed the small escutcheon, without extensions onto the legs, of *S. savagei* (in contrast to all other geckos associated nomenclatorially with

"*Sphaerodactylus notatus,*" with the exception of *juanilloensis*). This feature is diagnostic of *S. savagei* in contrast to *S. difficilis*. In *S. s. savagei,* the eseutcheon is composed of 3–6 by 6–17 scales (means 4.5 by 12.3), whereas in *S. d. diolenius* it is composed of 3–8 by 8–26 scales (means 5.5 by 17.8). The escutcheon in *S. s. savagei* is more compact than that of *S. d. diolenius* and extends less far onto the legs. The two species differ markedly in dorsal body pattern, the differences being more striking in females than in males. Finally, the midbody scales of *S. d. diolenius* vary between 40 and 53 (mean 46.6 ± 0.3), whereas in *S. s. savagei* the midbody scales vary between 34 and 50 (mean 44.3 ± 0.8). The means are significantly different, and in fact the midbody mean of *S. s. savagei* is lower than that of all subspecies of *S. difficilis* with the exception of far northwestern *S. d. lycauges.*

Specimens examined.—República Dominicana: *La Romana Province,* La Romana (MCZ 73900, ASFS V3074–76, ASFS V14477–79, ASFS V14697, ASFS V35001–70); 2 km E La Romana (ASFS X9317); 8 km E La Romana (ASFS X9295–314); mouth of Río Chavón, west side (ASFS V1061, ASFS V28835–37); 1 mi (1.6 km) NE Boca Chavón (ASFS V1075).

Sphaerodactylus savagei juanilloensis Shreve

Sphaerodactylus notatus juanilloensis Shreve, 1968, Breviora, Mus. Comp. Zool., 280:8.

Sphaerodactylus savagei juanilloensis: Schwartz and Thomas, 1975:161.

Type-locality.—Juanillo, La Altagracia Province, República Dominicana.

Holotype.—MCZ 73901.

Definition.—A subspecies of *S. savagei* characterized by a combination of mean low number (37–49 on the mainland, 38–46 on Isla Saona) of midbody scales, and female pattern composed of dark crossbands, this pattern often greatly obscured by fragmentation, and never lineate; pale ocelli variably present in both males and females.

Distribution.—La Altagracia Province, República Dominicana, from El Macao in the north, south to the Boca de Yuma-San Rafael del Yuma region, and Isla Saona (Fig. 1); also apparently Isla Catalinita.

Variation.—The series of *S. s. juanilloensis* may be divided for convenience of discussion into two subseries: 54 specimens from La Altagracia Province and 103 specimens from Isla Saona. The mainland specimens have the following measurements and counts (means in parentheses): largest male (ASFS V877) 33 mm snout–vent length, largest females (ASFS V28966, ASFS V35110) 32 mm snout–vent length; dorsal scales between axilla and groin 20–28 (22.8); ventral scales between axilla and groin 25–33 (29.5); midbody scales 37–49 (42.2); supralabials to mid-eye 3/3 (35 individuals), 3/4 (5), 4/4 (1); internasals 0 (1 individual), 1 (51), 2 (2); fourth toe lamellae 8–13 (10.7; mode 11); gular, chest, and ventral scales always smooth; escutcheon 3–6 (4.5) by 5–12 (8.8). One hundred and three Saona specimens have the following measurements and counts: largest males (ASFS V16251, ASFS V16256) 29 mm, largest females (ASFS V3044, ASFS V16252–53) 30 mm snout–vent length; dorsal scales between axilla and groin 20–27 (23.5); ventral scales between axilla and groin 27–35 (30.4); midbody scales 38–46 (41.5); supralabials to mid-eye 3/3 (35 individuals), 3/4 (4); internasals 0 (1 individual), 1 (101), 2 (1); fourth toe lamellae 8–12 (9.9; mode 10); gular, chest, and ventral scales always smooth; escutcheon 3–6 (4.4) by 5–14 (8.3).

Males from the mainland vary in dorsal coloration from tan or purplish tan to gray or dark brown. The heads and throats are yellow to bright orange; the dorsum (and heads in many individuals) are punctate with darker spots to give a salt-and-pepper effect. Rarely are the dark dorsal markings aligned; an exception is ASFS V35112, which shows vague indications of transverse banding; this specimen also shows some evidence of pale and widely spaced transverse caudal bands, which are either very obscure or entirely absent in other males. Scapular ocelli are buffy to gray and are variably present; most males lack them. The ventral coloration is gray to pale grayish, and the throats vary from immaculate to heavily spotted with dark brown.

Males from Isla Saona are comparable to mainland males in both dorsal and ventral color and pattern. However, of a series of 18 Saonan males, only one has the throat spotted.

Mainland female *juanilloensis* are generally transversely banded with dark brown to black on a pale gray to grayish tan or yellow-brown ground, with scattered white or buffy scales accenting the crossbanding. In some females (ASFS V35259), the tails are vividly marked with four white spots, outlined with blaek. The head pattern is variable, but there usually are three cephalic lines, the central one obscured or absent on the snout, connected to a scapular rectangle or its remnants, and a pair of faint pale ocelli in a more or less clear area. This pattern is quite variable and in one extreme instance (ASFS

V28970) the head and shoulder patterns are completely obscured by overlying dark stippling and marbling. Indeed, the body pattern itself is also variable, and not all females are crossbanded; at the other extreme are females which are male-patterned salt-and-pepper dorsally and are distinguishable from males only by the presence of a lineate head pattern. As in the males, the ocelli are variably expressed; at best, they are faint and whitish, and at the other extreme they are merely small clear areas of dorsal ground color. The throats are immaculate or may have some diagonal lateral gray markings.

Saona females were recorded in life as gray- or black-spotted dorsally with yellowish to cream crossbands and (if present) yellowish to cream ocelli, these ocelli surrounded by black to brown pigment. The tails were gray to dark yellow with dark-edged cream crossbands and the venter was pinkish to gray. The throats are unspotted, but a few females have the throat indistinctly marbled with brown. Head and scapular patterns are as described for mainland material.

Juveniles from the mainland and those from Saona are similar, except that there seems to be a stronger tendency in Saona juveniles to be transversely banded. The patterns in both samples are more often widely spaced dark spots or dots on a tan to medium brown ground. The iris color in both sexes is yellow in adults.

Sehwartz and Thomas (1975:161) noted the occurrence of *S. savagei* on Isla Catalinita. This record is based on 12 specimens (in the USNM and the Los Angeles County Museum) which we have examined only casually. Superficially they resemble Isla Saona *S. savagei* in both color and pattern, and scutellation. Since the two subspecies of *S. savagei* are weakly differentiated, we see no reason to suggest that the Catalinita specimens are different from those on Isla Saona, for which we use the name *S. s. juanilloensis.*

Comparisons.—We stated previously that *savagei* and *juanilloensis* are rather weakly differentiated, although we regard them as distinct. Part of the problem is the material from Isla Saona which is extremely variable in dorsal pattern (the only critical character between the two taxa) and in many ways seems to bridge even further the character differences between the two mainland subspecies. The fact remains that, when living specimens of *savagei* and *juanilloensis* are observed together, the two subspecies in series are seen to be quite distinctive, but these differences are subtle and disappear to a large extent in preserved animals. The fact that most *savagei* and some *juanilloensis* females are salt-and-pepper dorsally, whereas some *savagei* are longitudinally lineate and some *juanilloensis* are transversely banded has caused us to regard the two populations as distinctive. As far as scutellation is concerned, *savagei* averages higher than *juanilloensis* in all dorsal scale counts, but the differences are never striking. Nevertheless, midbody scales in *savagei* (44.3 ± 0.8) are significantly different from those of both the mainland (42.4 ± 0.8) and the Saona (41.5 ± 0.3) populations of *juanilloensis.* It seems likely that the Saona lizards are derived from an as yet unsampled mainland population which occupies the southeastern peninsula between Boca de Chavón and Boca de Yuma. These two localities mark, respectively, the known western and eastern extremes of the ranges of *savagei* and *juanilloensis,* and intergradient specimens presumably occur on the peninsula proper. It seems likely that the Saona population has been derived from this presumed intergradient population, since Isla Saona lies across the extreme southern end of the peninsula.

Remarks.—In La Altagracia Province, *S. s. juanilloensis* has been encountered under palm trash along beaches, under rocks and logs in semi-mesic woods, and in piles of fallen bark and in dead tree stumps and among petiole bases of dead palmettos in dense dry woods. Two juveniles were taken beneath boards adjacent to a shack in hot coastal scrub. One juvenile fell from an overhanging living palm frond onto the collector during the day, and an adult was encountered at night 0.6 m above the ground on a cycad (*Zamia*) after a heavy nocturnal rain. Apparently *S. savagei* climbs upon occasion.

The previous discussion has dealt exclusively with specimens from the eastern extreme of Hispaniola and Isla Saona. There is another population of *S. savagei* between 2 and 10 km NE Sabana Grande de Palenque in San Cristóbal Province, some 200 km west of the nearest record for *S. s. savagei* (La Romana). The material from Sabana Grande (ASFS V14425, ASFS V28514–18, ASFS V28462, ASFS V42525–39) is composed of 13 juveniles, one adult female (ASFS V28514, snout–vent length 33 mm), and five subadult males and two subadult females (snout–vent lengths 25–29 mm). There is nothing distinctive about the subadults and juveniles, and seale counts are not unusual. The adult female is heavily mottled (very grossly salt-and-pepper) with

black and with scattered white scales dorsally. There is a pair of white ocelli but no solid dark scapular area (although a hollow dark rectangle is present), and the tail is contrastingly crossbanded with about four white bands, broadly outlined with black. The snout–vent length of the female is 1 mm greater than that of any other female *S. savagei.*

Although the series resembles other *S. savagei,* it seems unlikely that it is properly assigned to either *savagei* or *juanilloensis.* But the lack of more adults of both sexes deters us from taking any nomenclatural action. There is also of course the possibility that this population, which appears to be rather local, is an introduction. On the other hand, we cannot cavalierly dismiss the possibility that there are other (relictual ?) populations of *S. savagei* between La Romana in the east and Sabana Grande in the west. All of our collections in this intervening area have yielded only *S. difficilis,* but this is negative evidence. The Sabana Grande lizards were taken under trash on a *Cocos*-planted beach and under trash in an abandoned army post. At nearby (but interior) localities (3.4 mi W Sabana Grande de Palenque; 2 km E Juan Barón) we secured only *S. difficilis.* The only other nearby coastal locality (4.8 mi S Baní) yielded only *S. difficilis.* We have thus been unable to extend the known range or our knowledge of the distribution and interrelationships of this western population of *S. savagei* with *S. difficilis.* Its taxonomic status likewise remains very uncertain and depends upon securing more adults and upon the status of the two more eastern subspecies.

The specimens from Isla Saona were taken in *Cocos* trash along the beach (Mano Juan) and in rock piles and *Cocos* trash adajcent to the beach and among the houses of the local *cuartel* at the northwest corner of the island. The species is exceptionally common on Isla Saona. As yet there are no *Sphaerodactylus* known from Isla Catalina, which lies closely offshore of La Romana. Either *S. savagei* or *S. difficilis* (or both) may well occur on that islet.

S. s. juanilloensis lies between the ranges of *S. c. apocoptus* and *S. d. diolenius.* It should be recalled that *S. s. savagei* and *S. d. diolenius* are syntopic at La Romana, but there are no records of syntopy between *diolenius* and *juanilloensis.* These two taxa approach each other most closely at 12 km E Otra Banda (*diolenius*) and 19 km SE El Macao (*juanilloensis*), a distance of about 17 km. Most records of *juanilloensis* are coastal, the exceptions being the two localities near San Rafael del Yuma, about 10 kilometers inland. The closest approach of *S. s. juanilloensis* and *S. c. apocoptus* is 0.1 mi SE El Macao and 5.7 mi SE La Vacama, a distance of about 15 km.

Although Shreve regarded *savagei* as a subspecies of *S. notatus,* along with *difficilis,* we are convinced that *savagei* is a species distinct from *S. difficilis.* We had this conviction prior to the collection of the two species syntopically at La Romana. The two species are comparable in size and in male coloration and pattern (although male *S. savagei* tend toward more pale colors than do male *S. difficilis*), but the small and almost patch-like escutcheon of *S. savagei* is quite different from that of *S. difficilis* with its poplitead extensions. Likewise, in having a compact escutcheon, *S. savagei* differs from *S. ocoae, S. clenchi,* and *S. lazelli.* Female *S. savagei* are quite different from female *S. difficilis, S. ocoae* and *S. clenchi*; the complex head-neck-scapular pattern of *S. savagei,* although derivable from the trilineate *difficilis* head pattern and scapular patch with included ocelli, differ in many details, not the least of which are the absence or reduction of the median snout-head line and the occurrence of ocelli within a *pale* area inside a darker scapular rectangle. *S. savagei* differs in scutellation in having only slightly enlarged median subcaudal scales (in contrast to usually widened scales in this position in *difficilis, clenchi,* and *lazelli*). In scale counts, *S. savagei* shows no overlap in dorsal or midbody counts with *S. clenchi,* and very little overlap in dorsal scale counts with *S. ocoae* (see Schwartz and Thomas, 1977:62). The overlap in midbody scale counts between *S. savagei* and *S. difficilis* is fairly great (total of 13 scales overlap), but the means in both subspecies of *S. savagei* are lower than those of all subspecies of *difficilis* except *lycauges.* The dorsal and midbody counts of the single *S. lazelli* fall within the known range of these counts in *S. savagei.* The lack of throat keeling in all specimens of *S. savagei* differs from the strongly keeled throat scales of *S. lazelli,* and the occasionally keeled throat scales of *S. difficilis, S. ocoae,* and *S. clenchi.*

Specimens examined.—REPÚBLICA DOMINICANA: *La Altagracia Province,* 0.2 km SE El Macao (ASFS V28959–61); 1.1 km SE El Macao (ASFS X7882–89); 1.4 km SE El Macao (ASFS V886); 8 km SE El Macao (ASFS V13115–17); 5.3 km SE El Macao (ASFS V28964–83); 19 km SE El Macao (ASFS V909); 1.2 km SSW Punta Cana (ASFS V35092, ASFS V35107–12); 5.5 km SSW Punta Cana (ASFS V35257–61); 14.1 km NE Juanillo (ASFS V29180–81); Juanillo (MCZ 73901—holotype); 0.8 km SE San Rafael del Yuma (ASFS V13810); 6.4 km SE San Rafael

del Yuma (ASFS V877); 0.8 km NW Boca de Yuma (ASFS V960). *Isla Saona,* environs of Mano Juan (ASFS V3041–52, ASFS V16187–90, ASFS V16251–302); 0.8 km W Mano Juan (ASFS V16203–29, LDO 7-5538–39); northwest corner (ASFS V34976–81).

Sphaerodactylus cochranae Ruibal

Sphaerodactylus cochranae Ruibal, 1946, Amer. Mus. Novitates, 1308:1.

Type-locality.—Bahía de San Lorenzo, El Seibo Province, República Dominicana.

Holotype.—AMNH 50233.

Definition.—A species of *Sphaerodactylus* with large, acute, strongly keeled, flattened, imbricate dorsal scales, axilla to groin 20 to 23; no area of middorsal granules or granular scales; dorsal body scales with hair-bearing scale organs, three to eight organs around free edge of scales and at times three organs set back from the edge, each organ with one hair. Dorsal scales of tail keeled, acute, imbricate, and flat-lying; ventral scales of tail smooth, rounded, slightly enlarged midventrally; gular scales smooth to keeled; ventral scales smooth rounded, imbricate, axilla to groin 20 to 26; scales around midbody 38 to 41; internasals 0 or 1; upper labials to mid-eye 3; escutcheon 5 by –.

Color pattern not sexually dichromatic, consisting basically of three prominent dark lines on a pale ground; scapular patch and ocelli absent. Iris color unknown.

Distribution.—Known only from the vicinity of the type-locality (Fig. 1).

Variation.—*Sphaerodactylus cocranae* is known from the holotype and paratype and another subadult specimen taken by Danny C. Fowler in 1971. The holotype is a female with a snout–vent length of 28 mm; the paratype is a very badly damaged male with a snout–vent length of 30 mm; and the freshly taken specimen is a young female with a snout–vent length of 25 mm. Combining data from all three specimens (and recognizing that the data from the male paratype are subject to inaccuracies) yields the following counts: dorsal scales between axilla and groin 20–23; ventral scales between axilla and groin 20–26; midbody scales 38–41; supralabials to mid-eye 3/3; internasals 0 (2 specimens) or 1; fourth toe lamellae 11 and 13 (no data from paratype); gular scales keeled in paratype, partially keeled in new specimen, smooth in holotype; chest scales partially keeled in paratype, smooth in two other specimens; ventrals smooth.

Ruibal's (1946) data on coloration and figure of the holotype pattern describe the pattern of *S. cochranae* excellently: "A middorsal stripe extending from the frontal region to the base of the tail varies in width but at mid-body embraces three scale rows. It is flanked on either side by a light stripe approximately two scales wide at mid-body. Dorsolateral blackish stripes extend from the nostril, through the eye, broadening above the ear opening, and continuing onto the sides of the tail. At mid-body the dorsolateral stripes fall on the ninth and tenth row of keeled scales. Ventrally, the lizard is immaculate, although scattered melanophores are present on the lighter areas of the dorsum. The legs are mottled brownish, the hind legs having a light-colored spot on the femur and knee. . . . Mr. Hassler in his field notes described the fresh specimen as having 'longitudinal black stripes on a pale tan or yellowish brown ground color; hind legs with slightly reddish spots; belly white.'"

Concerning the color and pattern of the freshly taken specimen, Fowler noted that the pale dorsal stripes were tan and the dark stripes dark brown. All stripes begin on the snout and continue to the tail base, where the upper surface of the tail is concolor with the pale dorsal stripes but has some brown stippling. The venter was tan with pink on the chest and at the vent. The forelimbs were patternless tan above, whereas the hindlimbs were tan with orange spots. The ventral surfaces of the limbs were tan.

Remarks.—Although Shreve (1968) did not include *S. cochranae* in his discussion of the *difficilis* complex, there seems little reason to exclude it. Ruibal (1946:3–4) suggested that *S. cochranae* was most closely related to *S. macrolepis* Günther from Puerto Rico, but that the species was also similar in some scale features to *S. samanensis* (which has the same type-locality as *S. cochranae*). Ruibal also noted some similarities with *S. copei,* an exclusively Haitian species which has a middorsal region of small granules, a feature which *S. cochranae* lacks. We consider *S. copei* to be most closely related to the predominantly Cuban *scaber* group of sphaerodactyls (Schwartz, 1961; Thomas, 1966), with which we cannot associate *S. cochranae.*

By virtue of its very strongly lineate dorsal pattern, *S. cochranae* differs from all other Hispaniolan members of the *difficilis* complex. Some specimens (females) of *S. difficilis* are lineate but never so strongly and contrastingly as *S. cochranae.* Likewise, the dorsal scales of *S. cochranae* are much larger (and thus dorsal counts are lower) than other members of the complex (or lie at the lower extremes

of dorsal scale variation in other species). Further comparisons are hardly necessary, since *S. cochranae* is a very distinctive species.

S. cochranae is now known to be sympatric with *S. difficilis* and *S. samanensis,* and it may be sympatric with *S. clenchi.* Fowler and Sheplan collected in four caves on the Bahía de San Lorenzo; in two they secured no geckos, in another *S. cochranae* and *S. difficilis,* and in another *S. samanensis.* Interestingly, although some female Bahía de San Lorenzo *S. d. diolenius* are somewhat lineate dorsally, they in no way approach the condition in *S. cochranae* in intensity of their markings, and we do not interpret them as intermediate between *S. cochranae* and *S. difficilis.*

The details of distributions of the species *cochranae, darlingtoni, difficilis, clenchi,* and *samanensis* along the southern shore of the Bahía de Samaná and farther east (where also *savagei* occurs) remain to be clarified. Although *S. clenchi* has not been taken sympatrically with *cochranae, samanensis,* or *difficilis* in this region, *clenchi* is known from Caba, only 23 km to the west at the head of the Bahía de Samaná. Since the San Lorenzo locality lies at the foot of the *haitises* region of the eastern República Dominicana, it is possible that the occurrence here of such "rare" species of *cochranae* and *samanensis* is due to the fact that collections at San Lorenzo are peripherally sampling a much more extensive distribution of *cochranae* and *samanensis* south of the Bahía de Samaná. These two geckos may be primarily inhabitants here of mesic forested limestone hills; however, Thomas and Leber secured only *S. darlingtoni* in the *haitises* proper (near Gonzalo), and at Caba on the coast we secured only *clenchi.* This entire region remains so poorly known herpetologically that further speculation is impossible.

Ruibal (1946), quoting field notes by Hassler, stated that the holotype was taken from the breakwater, and the paratype from a limestone wall near the caves. Fowler's specimen was taken from trash just within the mouth of a cave immediately south of the mouth of the Bahía de San Lorenzo. This and other local caves are now used by Sabana de la Mar fishermen as temporary retreats, and thus there has accumulated in them a quantity of human refuse, in which the *cochranae* was secured. Wetmore and Swales (1931) have a photograph (Pl. 13) of one of the Lorenzo caves, which have long been well known as fossil sites.

Our examination of the two original specimens of *S. cochranae* showed that there were only knob-like scale organs present on the dorsal scales. The freshly taken individual definitely shows hair-bearing organs. Although it is barely conceivable that the differences are ontogenetic, we suspect that the older specimens (which have long been preserved and repeatedly handled) no longer possess hairs in the scale organs merely because of their history. Only additional material will verify this suggestion.

Specimens examined.—REPÚBLICA DOMINICANA: *El Seibo Province,* Bahía de San Lorenzo (AMNH 50233—holotype); 1.2 km inland from Bahía de San Lorenzo (AMNH 50133); Cuevas de Caño Hondo (ASFS V35284).

Sphaerodactylus darlingtoni Shreve

Sphaerodactylus darlingtoni Shreve, 1968, Breviora, Mus. Comp. Zool., 280:15.

Sphaerodactylus noblei Shreve, 1968, Breviora, Mus. Comp. Zool., 280:17.

Definition.—A species of *Sphaerodactylus* with large, acute, flattened, imbricate dorsal scales, axilla to groin 24–36; no area of middorsal granules or granular scales; dorsal body scales with four to six hair-bearing organs around apex, each with a single hair. Dorsal scales of tail keeled, acute, imbricate, and flat-lying; ventral scales of tail smooth, rounded, enlarged midventrally; ventral scales smooth, rounded, imbricate, axilla to groin 24 to 31; scales around midbody 48 to 59. Snout moderately blunt in dorsal aspeet, slightly depressed, not decurved; snout scales small, elongate, keeled, subimbricate to imbricate; postnasals 1 or 2; internasals 1 to 3; supralabials to mid-eye 3; dorsal head scales small, elongate, keeled, imbricate to juxtaposed; temporal scales small, rounded, keeled, raised on posterior edge. First infralabial slightly broader anteriorly than posteriorly, subrectangular; gular scales between infralabial rami very small to small, keeled, subimbricate; central gulars small to very small, almost granular, subimbricate, keeled; fourth toe lamellae 6 to 11; escutcheon with a narrow central area (mode 2–3 scales in length) with extensions onto thighs to popliteal region (2–5 by 14–28).

Coloration not sexually dichromatic in pattern. Dorsal pattern of a central, bilobed, light mark on head, followed by paired or bilobed light marks on occiput; paired scapular ocelli and scapular patch; light border of scapular figure divided into separate anterior and posterior portions, the anterior portion roughly U-shaped with median anteriad indentation, the posterior portion roughly U-shaped, set off from scapular patch. Sacral figure of dorsolateral light lines; tail pattern of light chevronate markings;

venters pale to heavily pigmented; throats unmarked to heavily marked with dark pigment.

Basic Pattern

The pattern of *S. darlingtoni* is conveniently described with reference to the pattern elements of *S. altavelensis*.

Anterior cephalic figure.—Clearly demarcated, light centrally with dark edge, cleft or bilobed with each lobe posteriorly directed, ending slightly posterior to auricular opening.

Posterior cephalic figure.—Two transversely positioned occipital lobes (separate or fused) having bold dark edges laterally and posteriorly but fading anteriorly and in some specimens confluent with the light central areas of the anterior cephalic figure.

Scapular figure.—Scapular patch (not present in all specimens) small, irregular, often bilobed, enclosing two small buff ocelli and (in its most complete development) with an anteriorly directed extension to the midregion of the scapular figure border.

Scapular figure border.—The border is a light vitta that encloses the scapular figure. In *S. darlingtoni* it is divided into two unconnected anterior and posterior parts. The anterior border is concave anteriorly (more or less U-shaped), at times with a midline anteriad extension or indentation; the ends extend forward on each side and curve ventrad, fading out in the vicinity of the auricular opening, where they may be closely juxtaposed to the posterior end of a light postauricular stripe. The posterior border is likewise concave anteriorly; its ends curve anteriorly and ventrally, fading out just anterior and dorsal to the forearm insertion. This posterior scapular figure border may be continuous or broken into dashes or ocelliform marks. The name "scapular figure border" is retained for the two markings described here because of their evident homology with the scapular figure border of *S. altavelensis* (Thomas and Schwartz, MS), which is a closed light figure surrounding the scapular figure. Hereinafter we refer to the anterior and posterior parts of the scapular figure border as "anterior border" or "posterior border."

Dorsal body pattern.—Varies from uniform brown through various degrees of flecking and spotting with dark brown or black to coalescence of darker pigment into indistinct crossbands or imperfect scattered ocelli.

Sacral figure.—Pairs of short, dorsolateral dark lines enelose a light zone on each side to give a lineate sacral figure. The sacral lines fade a short distance anteriorly but posteriorly merge into the tail pattern, in which (in its best expression) the dark dorsolateral lines have mesiad diagonal extensions with associated light areas producing a posteriorly directed chevronate-ocellate pattern. The dark-edged light areas may be especially prominent on the base of the tail and even on the posterior sacral region, producing an adjunct to the sacral pattern.

Ventral coloration.—Venters have various degrees of uniformly dispersed dark pigment ranging from nearly uniformly pale (off-white) to dark gray in intensity; some specimens show indications of ventral lines reminiscent of *S. altavelensis*. Throats vary from nearly unpigmented to heavily marbled with dark pigment, producing a pattern of light spots on a dark ground that merges laterally with the light and dark labial and postocular markings.

Distribution.—North-central and eastern Hispaniola, from Valverde Province, east and south onto the Península de Samaná, south to the vicinity of Esperalvillo in San Cristóbal Province and east to La Romana Province. To the west and southwest, populations distantly removed from the rest of the known range of the species occur in the north range of the Sierra de Neiba south of Elías Piña and in the Sierra Martín García (Fig. 3).

Sphaerodactylus darlingtoni darlingtoni Shreve

Sphaerodactylus darlingtoni Shreve, 1968, Breviora, Mus. Comp. Zool., 280:15.

Sphaerodactylus darlingtoni darlingtoni: Schwartz and Thomas, 1975:149.

Type-locality.—Pico Diego de Ocampo, summit dome, *ca.* 4,000 ft, between Puerto Plata and Santiago, Santiago Province, República Dominicana.

Holotype.—MCZ 44380.

Distribution.—The western part of the Cordillera Septentrional of the República Dominicana, where known from Pico Diego de Ocampo west to Valverde Province.

Definition.—A subspecies of *S. darlingtoni* characterized by the presence of a single postnasal, by a posterior cephalic figure not strongly connected with the anterior cephalic figure, and by posterior border set off from a small scapular patch.

Variation.—Largest male (MCZ 44380) 25 mm snouth–vent length, largest female (ASFS V34223) 29 mm snout–vent length; dorsal scales axilla to groin 24–36 (30.0); ventral scales axilla to groin 24–29 (26.3); midbody scales 49–59 (53.5); supralabials to mid-eye 3/3; internasals 1 (30), 2 (4); fourth toe lamellae 9–11; throat scales strongly to weakly keeled; escutcheon 2–5 by 11–21.

Coloration is basically as described for the species. Males show a tendency towards uniform (unspotted) dorsal body coloration. The posterior cephalic figure may be represented by a single transverse or straight shallow V-shaped mark, or two, three, or more isolated light marks (Fig. 4). Scapular patches vary from well developed, completely enclosing ocelli and with anteriad extension to scapular figure border, to reduced and not completely surrounding ocelli or reduced to isolated black margins to each ocellus. In several specimens the anterior scapular figure border is most prominent in a short middorsal segment, but the ends, although faint or interrupted, can be seen following approximately the normal course. One individual (ASFS V32252) shows extreme reduction of head pattern. The median anteriad indentation of the anterior scapular figure border is lacking or indicated by only a slight widening; in four it is reversed (that is, the border is V-shaped). Throats are uniform pale to heavily marbled with dark gray

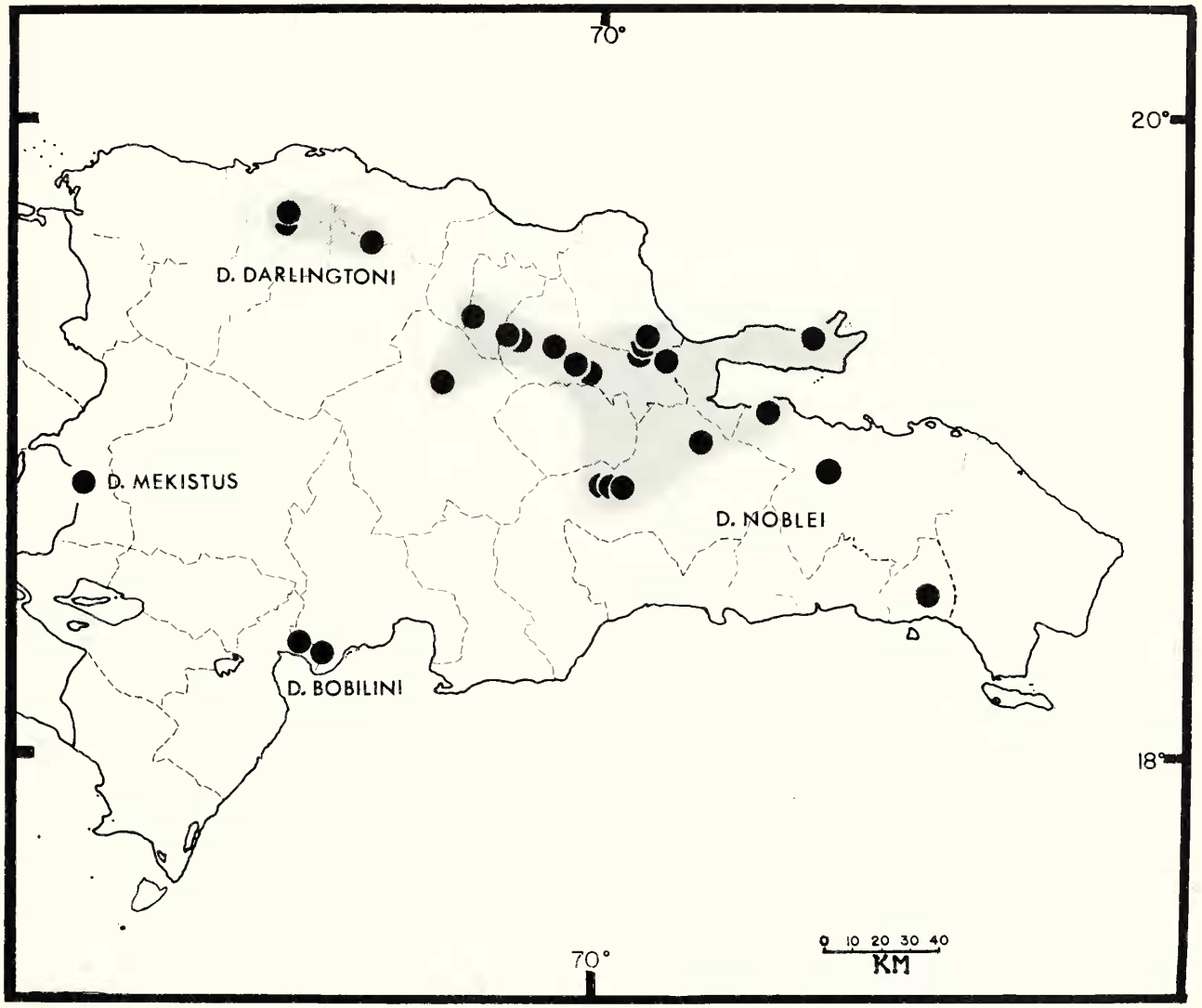

Fig. 3.—Map of eastern Hispaniola showing the distributions of the subspecies of *Sphaerodactylus darlingtoni*.

and white; there is a greater tendency for males to have marked and females unmarked throats. The holotype is almost completely patternless except for a smudge indicating the scapular patch and some ambiguous markings, possibly not true pattern remnants, on the head. The paratype (MCZ 44379), although faded, has sufficient pattern evident to associate it with the small dark geckos of northeastern Hispaniola. An anterior cephalic figure is plainly evident, and, although not bilobed, this characteristic is variably expressed in the species. The specimen possesses an anterior scapular border, the extremities of which proceed auriculad, and a posterior border, the extremities of which fade out near the forearm insertion. An irregular but bold scapular patch is in contact with the anterior scapular figure border; the ocelli, not completely enclosed by the patch, are not evident, probably because of fading of the ground color. The paratype additionally shows faint, irregular, dark-edged, light crossbars on the dorsum, a pattern variant found in occasional specimens (ASFS V32664, ASFS V33505); a lineate sacral pattern; and a marbled throat pattern.

Color in life: the dorsal ground color dark wood brown (almost black) to medium brown; the scapular patch is black and the ocelli white. Light head and scapular markings are buffy or whitish, and venters dark brown overlying deep yellow.

Remarks.—Shreve (1968) regarded the "absence of distinctly keeled scales on the throat" as a diag-

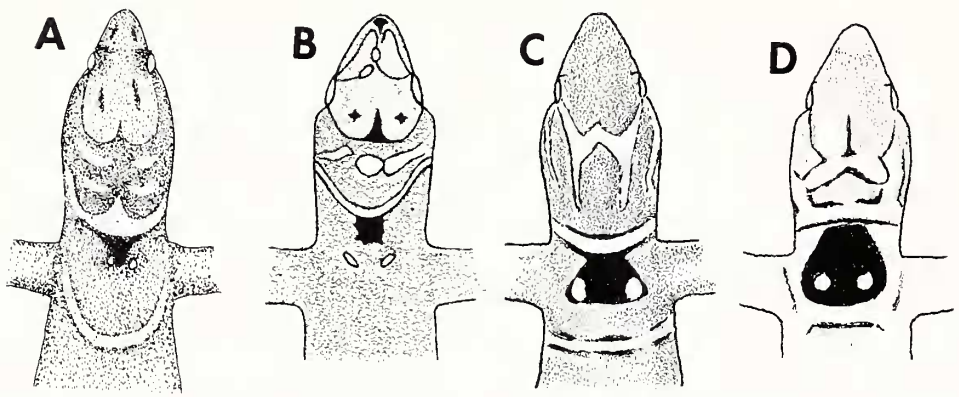

Fig. 4.—Diagrammatic dorsal views of cephalic and scapular patterns of *Sphaerodactylus darlingtoni:* A) *S. d. darlingtoni*; B) *S. d. noblei*; C) *S. d. bobilini*; D) *S. d. mekistus.*

nostic feature of *darlingtoni* versus *noblei,* but faint keeling is evident on the throats of the holotype and paratype of *darlingtoni* (part of the difficulty in discerning the keeling is likely a result of the age and poor condition of the specimens). Keeling is variable, however, in *noblei* (see below) and, although modally present, it may be very weak or absent. There is no difference in keeling between the two taxa. Except for the presence of a single postnasal, the other meristic differences noted by Shreve between *darlingtoni* and *noblei* have been swamped in the longer series of these geckos presently available. The incidence of single postnasals is geographically circumscribed, and the overwhelming similarity of these geckos in other aspects of scutellation and in coloration to the more eastern populations leaves us with little doubt that the names *darlingtoni* and *noblei* apply to a single species.

Specimens examined.—República Dominicana: *Santiago Province,* Pico Diego de Ocampo, summit dome, *ca* 1,220 m, between Puerto Plata and Santiago (MCZ 44380—holotype; MCZ 44379). *Valverde Province,* 9.4 km N Cruce de Guayacanes, 427 m (ASFS V22251–68); 9.9 km N Cruce de Guayacanes, 427 m (ASFS V27617–18, ASFS V27633–37).

Sphaerodactylus darlingtoni noblei Shreve

Sphaerodactylus noblei Shreve, 1968, Breviora, Mus. Comp. Zool., 280:17.

Sphaerodactylus darlingtoni noblei: Schwartz and Thomas, 1975: 149.

Type-locality.—Los Bracitos, Duarte Province, República Dominicana.

Holotype.—AMNH 45216.

Distribution.—Northeastern República Dominicana from Salcedo and northern La Vega provinces east to the Península de Samaná, south to central San Cristóbal Province (Esperalvillo) and southeast to El Seibo and La Romana provinces.

Definition.—A subspecies of *Sphaerodactylus darlingtoni* in which the nasal scale is contacted posteriorly by 2 postnasals, the posterior cephalic figure is separate from the anterior cephalic figure, and the posterior border is set off from the small scapular patch (Fig. 4B).

Variation.—Largest male (ASFS V33545) 25 mm snout–vent length, largest female (ASFS V32259) 27 mm snout–vent length; dorsal scales between axilla and groin 25–33 (28.7); ventral scales axilla to groin 24–31 (26.9); midbody scales 47–56 (51.6); supralabials to mid-eye 3/3; internasals 1 (48); 2 (39), 3 (10); fourth toe lamellae 8–11; throat scales strongly to weakly keeled; escutcheon 2–5 by 11–28.

Coloration generally as described for the species. The anterior cephalic figure varies from strongly bipartite with acuminate lobes to weakly cleft with rounded or truncated lobes. The posterior cephalic figure is modally separate from the anterior figure, each of the two parts being roughly oval with a median anastomosis, but it may be fused into a transverse oval with no indication of the paired condition, or the two parts may be completely separate, resulting in a pair of occipital ocelli. In the modal bilobate configuration the figure may be open anteriorly (no dark margin and interior light area fading to ground color or anastomosing with the anterior cephalic figure). The anterior border of the scapular figure varies from complete as described for the species, to abbreviated without extensions onto the side of the head; the median anteriad extension is prominent to absent and when present may (rarely) join with the posterior cephalic figure.

The scapular patch is typically as described for the species but may be reduced to a small smudge without ocelli or may be absent. Ocelli alone may be present without indication of a scapular patch or with only a broad dark margin around each ocellus as a remnant of the scapular patch. The posterior border is incomplete in most specimens, frequently broken into dashes or weak ocelli which follow the outline of a regular border with various degrees of fidelity.

Color in life: The dorsal ground color is very dark brown, in some animals almost black. Anterior and posterior cephalic figures and scapular figure borders are buff to yellowish brown. Venters are dark brown with a dull orange underlayer or gray to cream with darker flecking, or yellowish brown or yellowish. Tail ground color is the same as that of the venters. Scapular ocelli are white or gray, and the iris color is golden.

Remarks.—Shreve (1968) commented on specimens of *S. darlingtoni* from the Bahía de Samaná region (USNM 74943 from Río San Juan on the Península de Samaná and USNM 74974–77 from Boca del Infierno on the south side of the bay), noting that they might belong to a distinct race because of differences in scale counts from the holotype and five paratypes of *S. noblei* (=*S. darlingtoni noblei*). However, the specimens in question do not differ in scale counts from our much larger sampling of the species from surrounding areas. The coloration of the Samaná region specimens is very faded, but what is visible does not differ radically from *darlingtoni*. In three of the specimens (USNM 74974–75, USNM 74977) the posterior cephalic figure is broad and arcuate, following the curvature of the posterior edge of the anterior cephalic figure. This condition is not typical of *darlingtoni* but is approached in some specimens (ASFS V33546, ASFS V34152, ASFS V33486 and others). A peculiarity of two of these three specimens (USNM 74974–75) is the presence of a light spot just posterior to the lateral extremities of the posterior cephalic figure on either side, that is, just dorsal and slightly posterior to the auricular opening. In the other Boca del Infierno specimen (USNM 74976) the posterior cephalic figure is irregular and, although broad, is not arcuate; it also lacks light posterolateral head spots. In the Río San Juan specimen the posterior cephalic figure is not clearly discernible but does not seem extensive or arcuate. Otherwise the five specimens show indications of, although not in every specimen, anterior borders, and sacral patterns, all typical of *S. darlingtoni*. Our specimens from 10 km NE Gonzalo (ASFS V3134–36), the locality for new specimens closest to Boca del Infierno, show no peculiarities that would ally them with the specimens in question. The pattern as a whole is rather typical of *S. darlingtoni*. The posterior cephalic figures are small, centrally positioned, and Y-shaped; temporal light spots are absent.

The Península de Samaná is an established region of endemism; and the *haitises* region on the south side of the Bahía, although poorly known herpetologically, is distinctive physiographically. We cannot presently exclude the possibility of there being one or more distinct subspecies of *S. darlingtoni* on the Península de Samaná or the area surrounding the bay; but on the basis of the few specimens available, we cannot affirm it either.

It is interesting that USNM 74943 is the only Península de Samaná specimen of *S. darlingtoni*. Our extensive collections on the Península in recent years have yielded no additional material. The very mesic habitat seems ideal, although many of our collections have come from the coastal areas of the Península, especially *Cocos* plantations along the south coast. However, *S. darlingtoni* has been taken in a variety of situations, including cultivation of various sorts, and we eannot account for its scarcity on the Samaná.

Specimens examined.—REPÚBLICA DOMINICANA: *Salcedo Province,* 3 km NW Salcedo (ASFS V2942–43). *La Vega Province,* Guaigüí, 4 km S La Vega (ASFS V18390); Guaigüí, 4.8 km S La Vega, 92 m (ASFS V33533–38). *Duarte Province,* 10.2 km SE Tenares, 214 m (ASFS V33499–508); 8 km NE Pontón (ASFS V3194, ASFS V3633); 7.2 km E Cruce de Pimentel, 122 m (ASFS V33486–88); 6.1 km NW San Francisco de Macorís (ASFS V28115–21, ASFS V28276–363); 29.9 km E San Francisco de Macorís (ASFS V28128). *María Trinidad Sánchez Province,* 2 km S El Factor (ASFS V1846–52); El Barro, 1.4 km N El Factor (ASFS V28097); 1.6 km S Caño Abajo (ASFS V34149–60, ASFS V34218–38); 4 km N Azucey (ASFS V16070–76). *Samaná Province,* Río San Juan (USNM 74943). *San Cristóbal Province,* 11 km W Esperalvillo (ASFS V14401–03); 10 km W Esperalvillo, 143–144 m (ASFS V28624–29, ASFS V40947–53); 2 km W Esperalvillo (ASFS V14396–98); 10 km NE Gonzalo (ASFS V3134–36). *El Seibo Province,* Boca del Infierno (USNM 74974–77); 10.5 km N Hato Mayor (ASFS V35296–98, ASFS V35305). *La Romana Province,* 13.4 km NE La Romana, 31 m (ASFS V28907, ASFS V35071–80).

Sphaerodactylus darlingtoni bobilini, new subspecies

Holotype.—USNM 194045, adult female, from the west slope of Mt. Busú, between 610 and 854 m, Barahona Province, República Dominicana, one of a series collected by Danny C. Fowler and Bruce

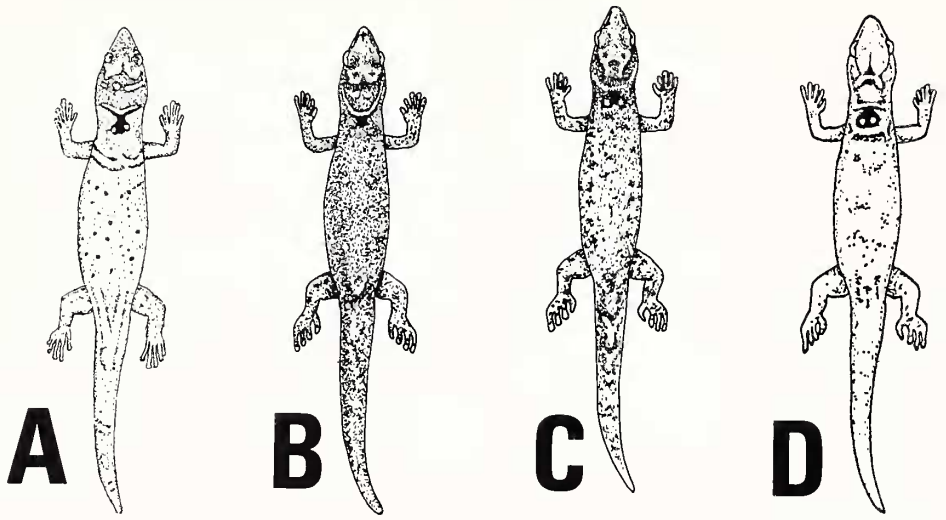

Fig. 5.—Dorsal views of subspecies of *Sphaerodactylus darlingtoni,* as follow: A) *S. d. darlingtoni* (ASFS V32251); B) *S. d. noblei* (ASFS V33499); C) *S. d. bobilini* (USNM 194045—holotype); D) *S. d. mekistus* (USNM 194046—holotype).

R. Sheplan on 15–17 September 1971. Original number ASFS V31236.

Paratypes.—ASFS V21173, Sierra Martín García, about 915 m, above Barreras, Azua Province, República Dominicana, Robert K. Bobilin, 20 July 1969; ASFS V31233–35, ASFS V31237–40, same data as holotype.

Definition.—A geographically disjunct subspecies of *S. darlingtoni* characterized by a fusion of each part of the paired posterior cephalic figure with the corresponding paired lobes of the anterior cephalic figure to form a slender posterior extension of each lobe of the anterior figure, posterior scapular figure border set off from scapular patch (Fig. 5C), and 2 postnasals.

Distribution.—Highlands of the Sierra Martín García in the southwestern República Dominicana.

Description of holotype.—An adult female with a snout–vent length of 26 mm, tail 21 mm (regenerated); dorsal scales axilla to groin 26, ventral scales axilla to groin 27, scales around midbody 53, fourth toe lamellae 9. Snout moderately blunt in dorsal aspect, slightly depressed; snout scales moderately-sized, flattened, keeled, subimbricate; 1 internasal; 2 postnasals; supralabials to mid-eye 3/3; dorsal head scales small, elongate, keeled, juxtaposed to subimbricate; temporal scales small, oval, swollen, keeled and only slightly raised on posterior edge. First infralabial slightly broader anteriorly than posteriorly, roughly rectangular in shape; gular scales between infralabial rami moderately small, juxtaposed to subimbricate, smooth to keeled; central gulars very small, smooth, imbricate; chest and ventral scales smooth.

Dorsal ground color brown, dorsum finely spotted with black one-scale-sized spots; buff anterior cephalic figure with weak basal bilobations and paired, narrow, elongate posterior extensions onto occiput. Anterior border curves anteriorly across base of neck and ventrally towards auricular opening; black scapular patch has narrow anterior contact with anterior border and bilobed posterolateral expansions to include a pair of buff scapular ocelli; posterior border asymmetrical, nearly complete but broken (that is, not continuous but composed of more or less discrete light dots). Lineate sacral figure composed of dark-edged light dorsolateral lines; dorsum of tail with series of paired elongate ocelli, each pair juxtaposed or fused to form a chevronate pattern. Venter pale (pinkish gray in life), scale edges stippled with black pigment; throat heavily stippled with black (Fig. 5C).

Variation.—Of the holotype and eight paratypes, the largest male (ASFS V31233) is 25 mm snout–vent length, largest female (ASFS V21173) 27 mm; dorsal scales axilla to groin 26–33 (29.5); ventral scales axilla to groin 27–31 (28.8); midbody scales 50–55 (52.5); supralabials to mid-eye 3/3; internasals 1 (7), 2 (2); fourth toe lamellae 9–10; throat scales weakly keeled in five specimens, smooth in four; escutcheon 3–5 by 24–26.

Three males show fainter (paler, not contrasting) cephalic figures and scapular figure borders and were noted as having a yellow-tan ground color in life in

contrast to the darker brown color of the females; one male with a poorly developed escutcheon (and therefore possibly immature) and included with the females in the color notes has a contrasting "female" pattern. As noted, the female ground color is darker and contrasts more sharply with the pale head markings and seapular figure borders; the scapular patches are more extensive. Venters were pinkish gray, throats heavily stippled black, and scapular ocelli white.

Remarks.—*Sphaerodactylus d. bobilini* is essentially an insular subspecies on a mesic island, the highlands of the Sierra Martín García, surrounded by xeric lowlands. As with any insular subspecies, its taxonomic position must be somewhat arbitrarily assigned. *Sphaerodactylus d. bobilini* could be described as a separate species with little danger of this decision being upset by the discovery of intergrades. On the grounds of proximity and the sharing of certain pattern elements, it might otherwise be presumed that *bobilini* is a high elevation derivative of *S. altavelensis,* abundantly present in the surrounding lowlands (Thomas and Schwartz, MS). However, the similarity in several respects (particularly the breaking of the scapular figure border into anterior and posterior parts and the configuration of these parts) of the *bobilini* pattern to that of northeastern Hispaniolan *S. darlingtoni* convinces us of the strong relationships of these two forms.

Etymology.—The subspecies is named in honor of Robert K. Bobilin who collected the original specimen.

Sphaerodactylus darlingtoni mekistus, new subspecies

Holotype.—USNM 194046, adult female, from 11 km S Elías Piña, 854 m, La Estrelleta Province, República Dominicana, taken by Richard Thomas on 13 August 1963. Original number ASFS V418.

Paratype.—ASFS V1449, same locality as holotype, hatched 22 September 1963 from egg taken on same date as holotype by Richard Thomas.

Definition.—A subspecies of *S. darlingtoni* characterized by modification of the posterior cephalic figure to form a pair of divergent, winglike lobes juxtaposed to the anterior cephalic figure, a compact scapular figure in which the anterior and posterior borders are in broad contact with the scapular pateh (Fig. 4D and 5D), and the presence of 2 postnasals.

Distribution.—Known only from the type-locality in the highlands of the Sierra de Neiba.

Description of holotype (data on paratype in parentheses).—An adult female, 25 mm snout–vent length (13), tail 20 mm (12), regenerated at tip. Dorsal scales axilla to groin 27 (28), no axilla to groin ventral count due to injury (25 for paratype), scales around midbody 47 (51). Snout moderately blunt in dorsal aspect, slightly depressed; snout scales moderately-sized, keeled, subimbricate to imbricate; dorsal head scales small, elongate, keeled, weakly subimbricate; temporal scales small, broad, rounded, raised posteriorly and keeled; 2 (2) postnasals; 2 (2) internasals; upper labials to mid-eye 3/3 (3/3); dorsal head scales small, elongate, keeled, subimbricate to weakly imbricate; temporal scales small, rounded, keeled, raised posteriorly; first infralabial slightly broader anteriorly, subrectangular; gular scales between infralabial rami medium to small, keeled to smooth, subimbricate to imbricate; central gulars very small, imbricate; chest and ventral scales smooth; fourth toe lamellae 10 (11). Anterior cephalic figure bilobed with broadly rounded lobes and interlobal cleft marked by massing of dark pigment, not by an indentation; posterior cephalic figure bipartite, in direct contact with posterior edge of anterior cephalic figure and with elongate posterolateral extensions. Anterior border broad, dark-edged, straight but with slight anteriad indentations; ends with faint anteroventral extensions towards auricular opening. Scapular patch oval with anterior pedicelate extension to anterior scapular figure border. Ocelli round, completely contained within patch. Posterior border broad and dark-edged, in broad contact with posterior edge of scapular patch. Left end of posterior border can be seen to proceed anteroventrally to just beyond forearm insertion. Dorsum brown in life with scattered sparse spotting (spots about one scale in size). Sacral figure of brief, dark-edged dorsolateral light lines; tail pattern of few, short, diagonal elements on base and diffuse distal spotting and banding (Fig. 5D). Venter stippled with dark pigment, particularly around scale edges (dull grayish orange in life, underside of tail brighter orange).

The paratype, a hatchling, has faint but complete eephalic and scapular patterns that agree in considerable detail with that of the holotype. Anterior and posterior cephalic figures are identical; the anterior scapular figure border shows the anteroventrad lateral extension on one side; the scapular patch seems to cover a greater area but does not completely include both ocelli. The posterior scapular figure border is in contact with the scapular patch, but the lateral extension toward the forearm insertion is very

faint and evident on one side only. The dorsum is uniform brown in coloration with a suffusion of dark pigment around the scale edges.

Color in life: Dorsal ground color dark brown with darker brown to black flecking; head markings buff to light brown; scapular spots white to buffy (paratype). Venter of holotype grayish, throat light gray; iris brown.

Remarks.—The holotype and the egg containing the paratype were taken beneath rocks along a roadside through montane rain forest. Another egg was taken that did not hatch; the eggs measured 7.8 by 5.3 mm and 8.1 by 5.5 mm.

Etymology.—The name *mekistus* is Greek and means "remote," in allusion to the geographic distance of this subspecies from other populations of the species.

Sphaerodactylus armstrongi Noble and Hassler

Sphaerodactylus armstrongi Noble and Hassler, 1933, Amer. Mus. Novit., 652:5.

Definition.—Dorsal scales small, acute, strongly keeled, flattened, imbricate, axilla to groin 29 to 46, no area of middorsal granules or granular scales; dorsal body scales with four to eight hair-bearing seale organs, each with one hair, around apex on distal margin; dorsal scales of tail keeled, acute, imbricate, flat-lying to slightly raised; ventral scales of tail smooth, rounded, enlarged midventrally; chest and ventral scales smooth, rounded, imbricate, axilla to groin 25 to 35; scales around midbody 49 to 75. Snout short and blunt, not depressed or decurved; rostral high and rounded with very small dorsal depression or flat area; snout scales small, narrow, swollen, strongly keeled, subimbricate to imbricate; internasals 0 to 3; postnasals 1, rarely 2; upper labials to mid-eye 3; dorsal head scales small, narrow, keeled, imbricate, raised to almost conical; temporal scales small, broad, obtuse, keeled, raised, subconical; gular scales between infralabial rami small, acute, keeled, imbricate; central gulars very small, keeled to smooth, imbricate; first infralabial broad anteriorly, subtriangular; fourth toe lamellae 7 to 14; escutcheon with broad central area and extensions onto thighs to popliteal region (3–9 by 10–30); ear diameter large (Fig. 6).

Sexual dichromatism incomplete; some males with a unicolor pattern. Pattern variable within and between subspecies but having, basically, paired light postocular stripes, occipitonuchal chevron or Y, and scapular ocelli without scapular patch; scapular ocelli sometimes transversely elongate and sometimes fused with stem of occipitonuchal Y; sacral pattern lineate; tail pattern of intermittently constricted middorsal zone derived from sacral middorsal zone; venter pale to stippled with dark pigment; throat pattern of dark lines.

Basic pattern.—The dorsal head pattern consists of a pair of light postocular stripes that may have various irregularities or emarginations of their upper (median) margin and a mesiad branch which may or may not meet with its mate of the opposite side to form a transverse light bar across the parietal region; the main branch of the postocular stripe may proceed posteriorly to join with another pattern element, a transverse crescent or shallow V or Y in the occipitonuchal region. In the scapular region or just immediately anterior to it occur two ocelli which show various stages of transverse elongation and fusion culminating in a scapular or posterior neck chevron or shallow V, which in some cases is joined to the stem of the more anterior Y figure producing a connected double chevron. The lateral head pattern includes one or two additional light postocular stripes (the dark edges of these stripes may appear as a series of dark postocular lines). The dorsum is brown and uniformly covered with an irregular spotted pattern of darker brown. In some specimens additional series of paired ocelli follow posterior to the scapular pair. The sacral pattern is lineate (a pair of dorsolateral dark-edged, light lines); the dark-edged, brown middorsal zone of the sacral pattern continues onto the tail after which its margins become irregularly scalloped with indentations which at times are marked by ocelli. Venters show some degree of dark stippling and vary from pale gray (off-white) to dark gray; undersides of throats have a pattern of dark lines (bold to very faint) or marbling, which are continuations of labial suture marks and postocular stripe borders.

Distribution.—Eastern half of the south island montane chain from the lowlands in the vieinity of Barahona and Paraíso, República Dominicana, west as far as the Massif de la Selle, Haiti (Fig. 7).

Sphaerodactylus armstrongi armstrongi Noble and Hassler

Sphaerodactylus armstrongi Noble and Hassler, 1933, Amer. Mus. Novit., 652:5.

Type-locality.—Mountain top of property of G. Herrmann, near Paradis (=Paraíso), 2,400 ft (732 m), Barahona Province, República Dominicana.

Holotype.—AMNH 51470.

Definition.—A subspecies of *Sphaerodactylus*

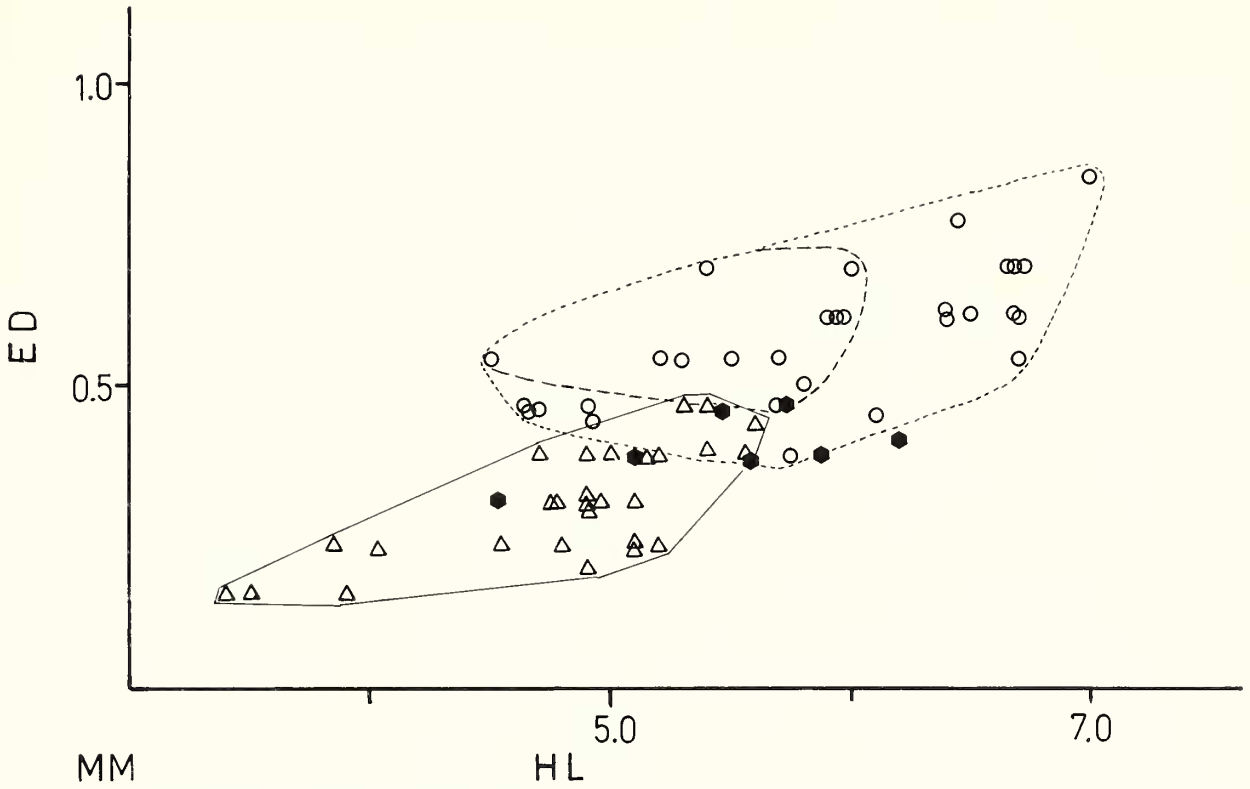

Fig. 6.—Ear diameter (ED) versus head length (HL) for *Sphaerodactylus armstrongi* (circles) and *Sphaerodactylus streptophorus* (triangles); both subspecies of both species are included; the heavy dashed line encloses values for *S. armstrongi armstrongi*; solid hexagons indicate specimens from Morne l'Hôpital and Soliette.

armstrongi having a V-shaped, light occipitonuchal figure frequently with a median posterior extension, ends of V usually not clearly joined to light postocular stripes; frontal region with a light transverse bar or crescent connecting the postocular stripes; scapular pattern of paired ocelli or ocelli fused to form a transverse bar or shallow V-shaped mark; one pair of ocelli on dorsum of trunk; sacral figure of dorsolateral light lines that indent on base of tail to (often) form a pair of ocelliform spots; midbody scale counts low to moderate (49–64); size moderate, to 27 mm SVL.

Distribution.—Known from the eastern extremity of the south island from the vicinity of Barahona south along the coast and foothills to the vicinity of Enriquillo, from sea level to at least 3,600 ft (1,098 m) (Figs. 1 and 7).

Variation (ranges and means given first for Barahona area, then for Paraíso area samples).—Largest male (ASFS V30950) 25 mm snout–vent length, largest females (ASFS V30951, V4413) 27 mm; dorsal scales axilla to groin 29–41 (35.6), 32–40 (35.3); ventral scales axilla to groin 25–34 (29.5), 25–34 (29.1); midbody scales 49–64 (56.9), 58–65 (61.1); supralabials to mid-eye 3/3; internasals 0–3; fourth toe lamellae 7–12; escutcheons 4–7 by 10–30.

The majority (68%) of the specimens have the occipitonuchal V with a median stem extending to the scapular region where it is flanked on each side by a prominent ocellus. These scapular ocelli may themselves fuse to form a posteriorly directed chevron attached centrally to the stem of the V (11%); intermediates between complete separation of scapular ocelli and complete fusion occur. The occipitonuchal chevron occurs without a stem in about 20% of the specimens; scapular ocelli or the fused (chevronate) ocelli occur in 100% of the specimens, about 10% having ocelli alone with none of the other pattern elements. (The pattern may not be detectable in some specimens because of fading.) The occipitonuchal figures and other parts of the pattern are generally more contrasting in the specimens from the lowlands between Paraíso and Enriquillo. The transverse head (frontal) bar is present in the ma-

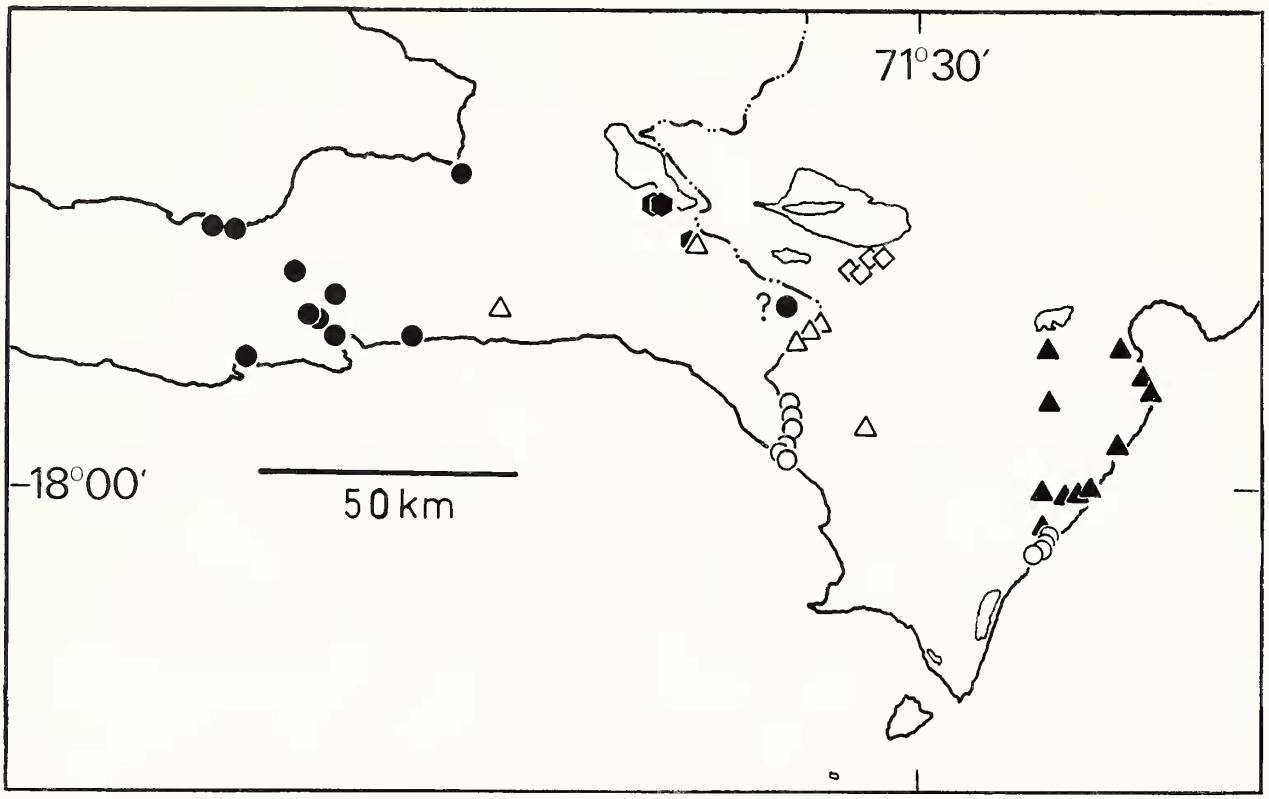

Fig. 7.—Distributions of four species of *Sphaerodactylus* in southeastern Haiti and southwestern República Dominicana, as follow: triangles = *S. armstrongi* (solid = *S. a. armstrongi,* hollow = *S. a. hypsinephes*); circles = *S. streptophorus* (solid = *S. s. sphenophanes,* hollow = *S. s. streptophorus*); solid hexagons = *S.* sp. 1; hollow diamonds = *S. cryphius.*

jority of specimens, although it is frequently faint, and in some cases the mid-region of the bar is indistinct; at times its posterior dark edge is all that is evident, the anterior edge being absent or fragmented. One male from Paraíso (ASFS V30443) shows the unicolor male pattern with only a faint trace of the basic pattern. Body ocelli are small and indistinct (without prominent dark edges) when present; 33% have just one pair on the dorsum slightly anterior to midbody; one heavily pigmented specimen (ASFS V20579) has about eight irregularly arranged small dorsal ocelli. The first postsacral indentation of the tail pattern often produces the effect of a pair of light ocelli on the tail base.

The series of 42 specimens from 11 km N Enriquillo at 1,098 m (ASFS V42121–62) is of especial interest. The size is larger than the other samples of this subspecies. The fused scapular ocelli occur in only one specimen; the occipitonuchal mark is sinuous (with a postauricular extension) rather than V-shaped in eight specimens; and all of the light head and neck markings are narrow rather than broad, as in the more coastwards populations. Thirteen specimens have a series of dorsal body ocelli. Midbody scale counts (55–69, mean 61.8, standard deviation 2.82) are much higher than the Barahona area specimens but not significantly higher than the Paraíso lowland specimens. These specimens show the influence of the more western, high-elevation subspecies described below.

Dorsal ground color in life is dark brown, very dark brown (nearly black) to reddish tan. The nuchal chevron is gray to buffy-orange or yellowish. Seapular ocelli are orange, dull orange to cream or white; and body ocelli, when they occur, have been recorded as yellowish. Light markings on the head are pale gray. Venters are grayish, and throats of males are yellow (ground color). Iris color is brown.

Remarks.—It is likely that the type-locality is in a somewhat intergradient area, similar to the above mentioned specimens from 11 km N Enriquillo, but since on balance of characters the holotype and

paratype agree more with the eastern coastal populations, we attribute the nominate trinomen to the easternmost subspecies.

The Barahona area specimens differ in certain respects from the lowland specimens of the Paraíso to Enriquillo region, the latter group having somewhat bolder head, neck, and scapular patterns. The two groups also differ in midbody scale counts, although there is considerable overlap (Table 1); by Student's *t*-test the difference is statistically significant ($P < .001$).

Specimens examined.—REPÚBLICA DOMINICANA: *Barahona Province*, 5 km S Cabral (MCZ 51820–21); 16.2 km S Cabral, *ca* 1,098 m (ASFS V4413); 4 km NW, 2 km SW Barahona, 153 m (ASFS V213–14); 3 km N, thence 3 km W Barahona (ASFS V20471–72); 2 km SE Barahona (ASFS X9521–25); 5 km S Barahona (ASFS V20555–83); 4.8 km S Barahona (ASFS V14060, LDO 7-5351, LDO 7-5355, LDO 7-5358–60); 6.7 km S Barahona (ASFS V4398–400); 5.3 km NE La Ciénaga (ASFS V39796–98); mountain top on property of G. Herrmann, near Paraíso (AMNH 51470—holotype); 1 km NE Paraíso, Río Nizaito (ASFS V16946, ASFS V30442–53); 3.0 km W Paraíso, 183 m (ASFS V30848–54, ASFS V35758–69); 6.6 km W Paraíso, 153 m (ASFS V30950–51); 11 km N Enriquillo, 788 m (ASFS V42121–62); 3 km N Enriquillo, 212 m (ASFS V42179–80).

Sphaerodactylus armstrongi hypsinephes, new subspecies

Holotype.—USNM 194047, an adult male, from 32 km N Pedernales, *ca* 4,000 ft (1,220 m), Pedernales Province, República Dominicana, taken by Richard Thomas on 28 July 1969. Original number ASFS V21482.

Paratypes (all from Pedernales Province, República Dominicana, except as indicated).—ASFS V2609, 5 km NE Los Arroyos, 5,800 ft (1,769 m), David C. Leber, 27 June 1964; ASFS V21479–81, ASFS V21483, same data as holotype; ASFS V21506–08, 25 km N Cabo Rojo, Richard Thomas, 29 June 1969; ASFS V29906, 4.4 mi (7.0 km) N Los Arroyos, 5,600 ft (1,708 m), Bruce R. Sheplan, 18 August 1971; ASFS V9749, 4 mi (6.4 km) SW Seguin, 4,400 ft (1,342 m), Dépt. de l'Ouest, Haiti, Richard Thomas, 27 March 1966; ASFS V37663–37723, 6.1 km SW Seguin, 4,000 ft (1,212 m), Dépt. de l'Ouest, Haiti, J. W. Norton, A. Sehwartz, W. S. Sommer, 2 June 1974; RT 5046–5279, 3.3 mi (5.3 km) SW Seguin, 3,700 ft (1,121 m), Dépt. de l'Ouest, Haiti, 30 June 1978, natives, Richard Thomas.

Definition.—A subspecies of *Sphaerodactylus armstrongi* having postocular stripes that join or nearly join an occipitonuchal chevron with ventrad postauricular marks; frontal region irregularly pigmented or with a light X- or V-shaped mark; a U-shaped (or other non-ocelliform) scapular marking; a series of dorsal trunk oeelli or ocelliform spots; sharply constricted (or bridged), non-ocellar postsacral middorsal zone; large size (males to 30, females to 31 mm snout–vent length); and high number of scales around midbody (61–75).

Table 1.—*Comparison of* Sphaerodactylus armstrongi armstrongi *and* S. a. hypsinephes.

Characters	*S. a. armstrongi* Barahona : Paraíso	*S. a. hypsinephes* Seguin : Los Arroyos
Occipitonuchal figure	V-shaped	Sinuous (with postauricular extension)
Frontal pattern	Light interocular bar or crescent	Mottled or light X or V
Median neck line	49%	10%
Scapular pattern	Paired ocelli 59% V-figure 11%	U-shaped 61% Irregular 38%
Dorsal body ocelli	1 pair	Dorsolateral series or irregular scattering
Caudal pattern	Ocelliform light indentations of dorsal zone	Complete or nearly complete bridge; non ocelliform
Snout–vent length		
Maximum (♂/♀)	23/24 : 25/27	30/31
Mode	22 : 24	27
Midbody scales (Mean ± 1 SD)	56.98 ± 3.14 : 61.14 ± 3.95 N = 47 N = 36	68.89 ± 2.81 : 63.36 ± 3.47 N = 87 N = 11
Range	49–64 58–65	61–75 58–69

Distribution.—Higher elevations (*ca.* 2,000 to 6,000 ft—606 to 1,830 m) of the western Sierra de Baoruco and the Massif de la Selle. The exact eastward extend of the subspecies is unknown but may extend to the Valle de Polo (see comparisons below). Its western range is apparently limited by the Vallée de Trouin in Haiti (Figs. 1 and 7).

Description of holotype.—An adult male, 27 mm snout–vent length, tail 25 mm; dorsal scales axilla to groin 38, ventral scales axilla to groin 30, midbody scales 62. Snout blunt, not depressed; snout scales small, acute, keeled, swollen, slightly imbricate; supranasals broader than long, roughly triangular; 1 internasal; 2 postnasals; first infralabial broad anteriorly, subtriangular; dorsal head scales small, narrow, keeled, raised posteriorly, almost conical; temporal scales small, broad, keeled, raised; gular scales between infralabial rami small, acute, keeled, imbricate; central gulars very small, acute, keeled, imbrieate; chest, ventral scales smooth; supralabials to mid-eye 3/3; fourth toe lamellae 9.

Dorsal ground color brown with irregular darker brown mottlings or vermiculations; light upper postocular stripe proceeds posteriorly and stops just before joining the lateral extremities of a broad, light occipitonuchal Y, the lateral ends of which turn ventrally and posteriorly for a short distance (postauricular mark). The stem of the Y extends posteriorly in the midline of the neck to a point between two faint, transversely oriented light marks that form an indistinct posterior nuchal U; the central region of the head has a faint patterning formed by lightening of the ground color in the parietal and frontal areas. The sacral figure consists of dark-edged, light dorsolateral lines that extend for a short way onto the base of the tail, where they form a series of indentations. The venter is pale yellowish in preservative, the throat pale with dark streaking and marbling as described for the species.

Variation.—Largest male 30, largest female 31 mm snout–vent length; dorsal scales axilla to groin 33–46; ventral scales axilla to groin 26–35; midbody scales 58–65; supralabials to mid-eye 3/3 (65), 4/4 (1); internasals 1 (12), 2 (4), 3 (3); fourth toe lamellae 8–14; throat scale keeling present in all; escutcheons have large central areas with extensions onto thighs to vicinity of knees (4–9 by 21–27).

A head pattern of postocular stripes that join or abut an occipitonuchal V having short, ventrad postauricular extensions is a consistent feature of this subspecies. A stem to the V occurs in a minority of specimens (about 10%). A more or less symmetrical U-shaped neck or scapular figure can be seen as the "ideal" condition but in reality occurs only modally (about 60%), being highly asymmetrical, reduced, fragmented, or divided in the rest. Departures from the symmetrical scapular U include: absence (sometimes with a dorsolateral series of body ocelli continuing onto the neck); a diagonal line; a straight transverse "collar;" a pair of reversed parentheses or comma-like marks; an apically interrupted V; and various other fragmentary eonditions (Fig. 8). All of these pattern elements are finely lineate, except that the postocular stripes may be broadened (but are always smooth-edged). The frontal pattern consists of irregular mottling or a light X-figure or (if the posterior half of the X is obscure) a pale V; a straight light connection between the postocular stripes is never found, and rarely a complete connection of any sort. The presence of a series of ocelli (or less regular ocelliform spots) on the body is a consistent feature, although the number and arrangement is not. The sacral light lines frequently extend well forward of the groin region; the first postsacral indentations may meet to form a complete bridge (43%), nearly meet (41%), or be separated by a distinct gap (6%); they are not ocelliform. Throat marbling is distinctly heavier in males, although there is overlap in intensity between the sexes. Males also tend to have a contrasting, vermiculate dorsal head pattern that does not obliterate the postocular and occipitonuchal pattern.

Comparisons.—Table 1 compares the features that most differentiate the two subspecies. Qualitative differences are also seen in the head, neck, and scapular markings, those of *hypsinephes* being formed of sharply delineated, narrow light markings, whereas those of *armstrongi* are broader and less well-defined. The two subspecies are markedly distinct, but the sample from 11 km N Enriquillo, noted under the account of *S. a. armstrongi,* indicates that intergradation does occur, very likely along an elevational zone in the eastern part of the Sierra de Baoruco. However, it is possible that "pure" *hypsinephes* is not encountered until farther west in the Sierra de Baoruco, perhaps west of the Valle de Polo, the main physiographic feature separating the eastern from the western Baoruco (and west of which elevations are generally greater).

Remarks.—A certain amount of intrasubspecific variation is present, particularly in scale counts. The western Sierra de Baoruco sample of *hypsinephes* (Los Arroyos vicinity) differs significantly in midbody counts from the Haitian Seguin area sample ($P < .001$, Student's t-test).

Etymology.—*Hypsinephes* is from the Greek meaning "dwelling high in the clouds."

When Thomas and Schwartz (1977) described *Sphaerodactylus streptophorus,* they included under that species, but not as paratypes, a few specimens from low to moderate elevations of southern Haiti, from the Jacmel region through the Trouin Valley. These specimens differed in some scale characters and in coloration from the samples from the República Dominicana. We have since obtained significantly more specimens from that region of Haiti and find that they represent an undescribed subspecies of *S. streptophorus,* for which we propose the name

Sphaerodactylus streptophorus sphenophanes,
new subspecies

Holotype.—CM 83100, a gravid female from Ravine Normande, 11.4 km (6.8 mi) E, thence 1.3

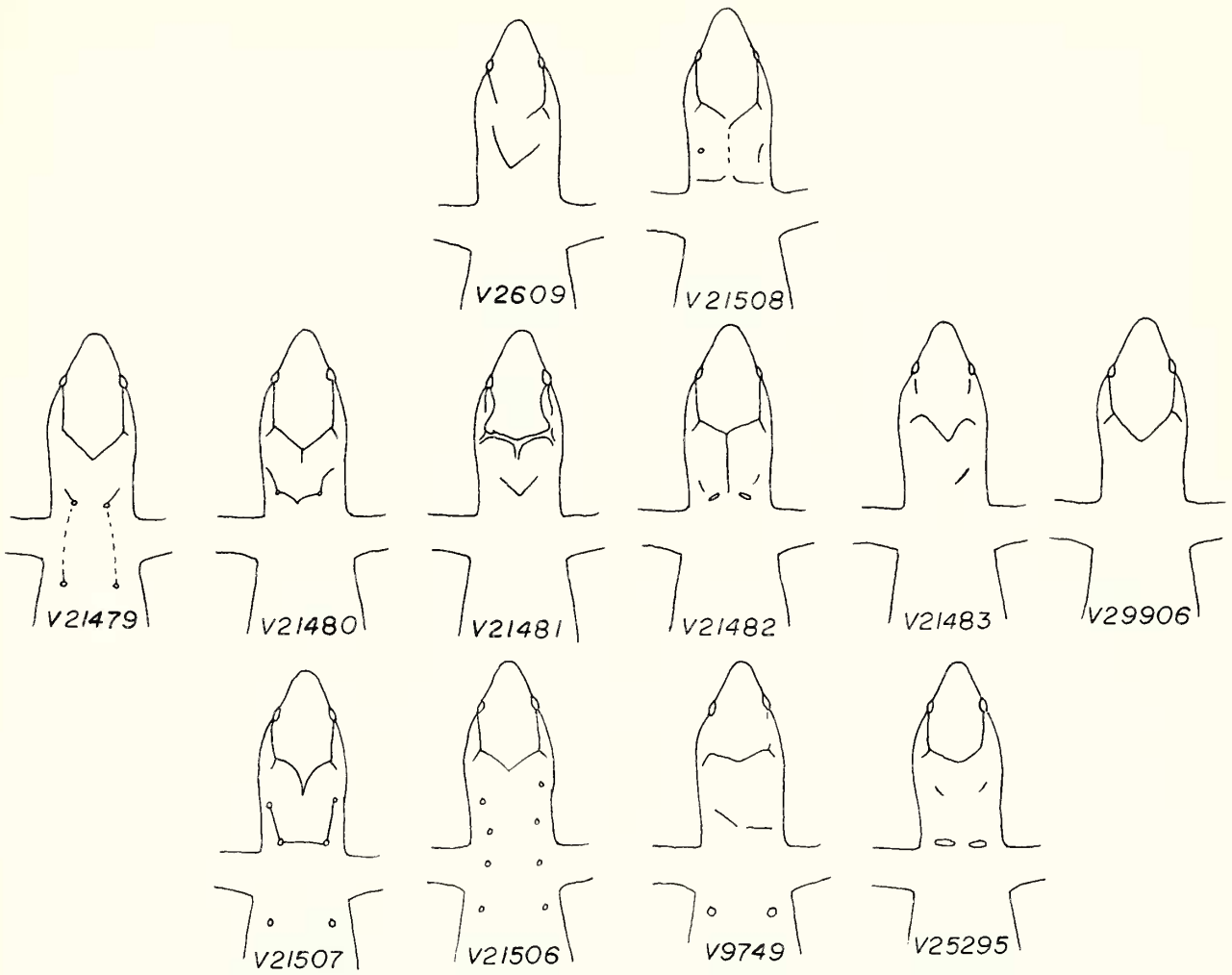

Fig. 8.—Head and anterior body patterns of *Sphaerodactylus armstrongi hypsinephes.*

km (0.8 mi) N Jacmel, 77 m (254 ft), Dépt. de l'Ouest, Haiti, one of a series collected on 26 June 1978 by natives and Richard Thomas.

Paratypes (all from the Dépt. de l'Ouest, Haiti).—ASFS V43590, 4.7 mi (7.5 km) E Petit-Goâve, 400 ft (121 m), 15 July 1976, native collector; ASFS V45347–53, same locality as preceding, 9 July 1977, native collectors; ASFS V43593–604, 2.5 mi (4 km) E Petit-Goâve, 15 July 1976, native collectors; RT 7559–66, 0.8 mi (1.3 km) NE Bainet, *ca* 200 ft (60 m), 21 July, 1979, Luís Rivera Cruz, R. Thomas; ASFS V9788–90, *ca* 2.4 km S Trouin, 244 m (805 ft), 28 March 1966, R. Thomas; RT 5479, 7.9 mi (12.6 km) SE La Vallée de Jacmel (=3.6 mi (5.8 km) NW ford of Rivière Gauche on La Vallée road), 1,000 ft (303 m), 7 July 1978, R. Thomas; RT 5473, 9.5 mi (15.2 km) SE La Vallée de Jacmel, 750 ft (227 m), 6 July 1978, R. Thomas; RT 5535–39, same locality as preceding, 9 July 1978, R. Thomas; RT 5293–94, Nan Sumac, 1.8 mi (2.8 km) S Decouzé, 1,400 ft (424 m), 2 July 1978, R. Thomas; RT 5445–53, same locality as preceding, 5 July 1978, natives, R. Thomas; RT 5532, 5 km (3 mi) airline W Jacmel, ravine of Petite Rivière de Jacmel, 1,000 ft (303 m), 8 July 1978, R. Thomas; RT 4974–76, same data as holotype; ASFS V37433–35, same locality as holotype, 30 May 1974, J. W. Norton, W. W. Sommer, A. Schwartz.

Associated specimens (all from Dépt. de l'Ouest, Haiti).—ASFS V25295, RT 4905–08, *ca* 5 km (airline) W Pétionville, north versant, Morne l'Hôpital, *ca* 2,000 ft (606 m); ASFS V37297, Soliette, 3.8 mi (4.0 km) NW Fond Verrettes, 2,000 ft (606 m); MCZ field numbers 0691, 0692, Savane Mouton, east of Forêt des Pins, *ca* 4,884 ft (1,480 m).

Definition.—A subspecies of *Sphaerodactylus streptophorus* characterized by the presence of paired ocelli or paired dashes on the neck rather than a continuous collar; a reduced incidence of paired scapular ocelli; lack of a contrasting, vermiculate head pattern in males; high number of midbody scales (52–62); smaller, more heavily keeled and raised (less cobblelike) snout scales; large size (males to 24, females to 26 mm snout–vent length).

Distribution.—Southern Haiti from the vicinity of Petit-Goâve south to Bainet and east to Ravine Normande, 11 km E Jacmel; elevational distribution from near sea level to 1,400 ft (424 m) at Nan Sumac. This subspecies possibly extends into the uplands near the Dominican border at Savane Mouton (4,884 ft; 1,480 m) (Fig. 7).

Description of holotype.—An adult female, 23 mm snout–vent length, tail 18 mm, partly regenerated; dorsal scales axilla to groin 36; ventral scales axilla to groin 32; scales around midbody 56. Snout blunt, not depressed; rostral with distinct flattened dorsal portion; snout scales small, acute, keeled, swollen, slightly imbricate (15 across snout between posterior ends of 2nd upper labials); supranasals broader than long, roughly triangular; 2 internasals; 2/2 postnasals; 3/3 upper labials; first infralabial broader anteriorly, subtrapezoidal; dorsal head scales and temporal scales small, broad, keeled, raised on posterior edges, subconical; gular scales between infralabial rami small, acute, keeled, imbricate; central gulars very small, acute, keeled, imbricate; chest and ventral scales smooth; fourth toe lamellae 10.

Dorsal ground color brown with darker brown mottling of irregularly interconnected scales that form the edges of irregular dorsolateral stripes. Dark-edged light dorsolateral stripes begin on posterior trunk and continue along sacrum onto tail, where a series of indentations constrict the dark interspace. Postocular stripe broad, light-centered, upper dark edge continuing posteriorly to weakly demarcate a central cephalic figure with indented sides. Mesially oriented temporal wedge formed by diagonal posterolateral margin of cephalic figure and a light posteroventral postauricular stripe. Indistinct narrow light transverse occipitonuchal line present. Ground color of entire head light, darkening immediately posterior to occipitonuchal line. A pair of small oval ocelli at mid-neck; no scapular ocelli; several small ocelli between ear opening and forearm insertion. Throat with indistinct light longitudinal stripes on a brown ground color that are continuous with light subocular stripes across labial region. Venter with frosting of dark pigmentation concentrated around scale edges.

Variation.—The temporal wedge, visible either as a complete wedge or as only the light posterior (postauricular) limb is present in 84% of the specimens. The bilobed cephalie figure is found in 26%, and an occipitonuchal mark, somewhat in the shape of a stretched out "M" is seen in 7%. (Contrary to the statement of Thomas and Schwartz, 1977:37, the transverse neck line or collar is not a homologue of the *armstrongi* occipitonuchal mark; rather, the occipitonuchal mark is obscured in most *streptophorus*.) The mid-nuchal marks are paired ocelli, similar to the condition in the holotype, in about 42% of the specimens; more elongate marks (paired dashes) occur in 26%; and an unpaired transverse collar occurs in 18%. Paired scapular ocelli occur in about 33%; 13% have irregular scapular markings (one ocellus or more than two), whereas 53% have no scapular markings. Body ocelli are generally not present (98%), but a few have irregular ocellations, not as well defined as, for example, the condition in *S. armstrongi hypsinephes*. A postsacral constriction of the middorsal zone is present in about 3%, although it is not extreme and does not result in paired ocelli on the base of the tail nor in a complete bridge of light pigment. Ventral lines are present (but not well-developed) in about 16% of the specimens. The throats of males are more boldly and contrastingly striped or marbled than those of females.

The largest male is 24 mm snout–vent length, the largest female 26 mm; dorsal scales axilla to groin are 28–36 (mean 30.28); ventral scales axilla to groin 25–33 (28.5); scales around midbody 52–62 (56.84); internasals 2 (44) or 3 (6); postnasals 2/2 (43), 2/1 (1), or 1/1 (1); scales across snout between posterior ends of second upper labial 14–17 (14.53); upper labials to mid-eye 3/3 in all; fourth toe lamellae 8 (1), 9 (16), 10 (29), or 11 (4); escutcheons 3–7 scales long by 10–26 scales wide with extensions onto thighs as far as popliteal region in some specimens.

Comparisons.—The principal comparison is with the nominate subspecies. *S. s. sphenophanes* is larger (modal snout–vent length 23 mm versus 20 for nominate *streptophorus*; maximum size 26 versus 23 mm). Midbody scale counts are significantly higher (52–62, mean 56.84 ± 2.19 standard deviation versus 41–54, mean 47.45 ± 10.66; means significantly different by *t*-test at $P < .001$), as are the number of scales across the snout (14–17, mean 14.53 ± 2.65 standard deviation versus 11–14, mean 11.35 ± 1.10; means significantly different by *t*-test at $P < .001$).

In coloration *sphenophanes* differs in possessing ocelli or paired dashes on the neck (79%) instead of the continuous collar (21% versus 93% in *streptophorus*). Over half (53%) lack any scapular mark, although 33% have a pair of ocelli, and the remaining 14% irregular or unilateral ocelli; 93% of nominate *streptophorus* have paired scapular ocelli, the

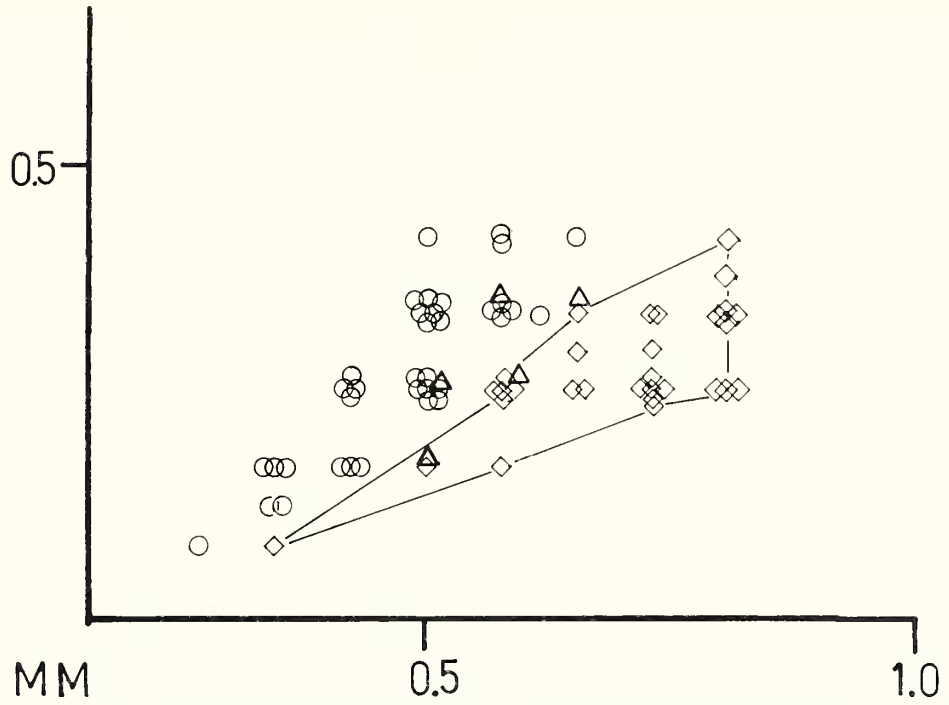

Fig. 9.—Length of rostral flat area (ordinate) versus total length of rostral (abscissa) for *Sphaerodactylus armstrongi* (circles) and *S. streptophorus* (squares); triangles indicate values for Morne l'Hôpital and Soliette specimens.

rest have none. The head pattern of nominate *streptophorus* is boldly vermiculate in males, but this is not true of *sphenophanes,* where vermiculation is much fainter and does not obliterate the head pattern.

We were not initially sure whether *sphenophanes* was closest to *streptophorus* or to *armstrongi.* The presence of *armstrongi*-like occipitonuchal marks in some specimens suggested a possible closest relationship with that species. But we (Thomas and Schwartz, 1977) have remarked on the strong affinities of all these geckos (*armstrongi, streptophorus, cryphius*) and have noted that they all share some homologous pattern features. We still cannot completely eliminate the possibility that these forms (plus another undescribed species from Haiti) constitute a single *Rassenkreis* but lacking evidence of intergradation we feel that there are distinct gaps between our species-level groupings.

The wedge marks on the head of *sphenophanes* and *streptophorus* are vestiges of the more complete occipitonuehal marks and abutting postocular stripes of *S. armstrongi hypsinephes,* the wedge being formed by the meeting of the postocular and postauricular stripes. As noted above, a few *sphenophanes* possess an M-shaped occipitonuchal mark. The possession of markings at mid-neck (ocelli, dashes, or a collar) further ally *sphenophanes* and nominate *streptophorus,* as does the possession of scapular ocelli by both forms (only some *sphenophanes*) along with lack of body ocelli. The lack of pronounced basal caudal constriction of the dark median zone of pigment is also a feature contrasting *S. streptophorus* and *S. armstrongi.* The diameter of the opening of the external auditory meatus is proportionately smaller in both *streptophorus* and *sphenophanes* than it is in *S. armstrongi* (Fig. 6). The rostral of *streptophorus* has a large, semicircular, dorsal flat area bordered by a distinct rim; the flat area slopes towards the tip, giving the scale a sloping profile. The rostral of *S. armstrongi* does not slope towards the tip so pronouncedly (or at all) and has a smaller flat or depressed dorsal area, the sides of which are usually rounded rather than ridged. A comparison of the distance from the rostral-supranasal sutures to the anterior edge of the flat area with the total length of the rostral (Fig. 9) shows a quantitative aspect of this difference. These characteristics of rostral shape and ear size should be added to the definition of *S. streptophorus.*

Remarks.—The habitat of *S. streptophorus sphenophanes* contrasts with that of the xerophilous

nominate subspecies. All specimens of *sphenophanes* came from mesic shaded situations, where they were taken in leaf-litter or under rocks. The type-locality is a shaded ravine, and all of the specimens were taken in *Musa* and *Artocarpus altilis* litter along the ravine sides (those collected by or with Thomas). At other localities *sphenophanes* was taken in coffee plantings (Nan Sumac); in an *Artocarpus* grove (9.5 mi SE La Vallée de Jacmel); in the mesic shady ravine of the Petite Rivière de Jacmel) among leaf-litter and limestone jumble; in banana and coffee plantings (7.9 mi SE La Vallée de Jacmel). At 0.8 km NE Bainet the region is somewhat more xerophytic than the other localities, although basically wooded rather than scrubby; the specimens were taken in leaf-litter in a grove of *Mangifera indica.* Along the south coast of Haiti, between the type-locality of *sphenophanes* and the range of the nominate subspecies, we took no *streptophorus* of any kind, even though there were habitats appropriate for either subspecies. The habitat at the localities reckoned from Petit-Goâve is basically mesic and in an area of mixed agriculture (including coffee, bananas, and corn) and mixed open to shaded habitats; the specimens were native collected, and we did not see the precise situations from which they came.

The specimens from the Morne l'Hôpital (ASFS V25925, RT 4905–08) and Soliette (ASFS V37297) have faint markings, although they show the postauricular stripes, indications of an occipitonuchal mark and indications of mid-nuchal marks, although the pattern of the Soliette specimen is fragmented. Two specimens (RT 4905–06) show faint or partial indications of an *armstrongi*-like prescapular U, and the others have scapular or prescapular ocelli. So they show some resemblances to *armstrongi hypsinephes* and are not completely typical of *S. streptophorus sphenophanes.* Midbody scale counts (51–61, mean 55.2) coincide with the range in *sphenophanes*; the rostrals are *streptophorus*-like, although their measurements (Fig. 6) are somewhat intermediate; ear size (Fig. 6) agrees more with *streptophorus.* Very likely these north-slope specimens represent another somewhat differentiated population, but more specimens will be needed to determine the variation. The fragmented pattern of the Soliette specimen is reminiscent of that of the Savane Mouton specimens (Thomas and Schwartz, 1977).

DISCUSSION

Fig. 10 shows our tentative inference of phylogenetic relationships in the *Sphaerodactylus difficilis* complex. Our ideas on a possible sequence of evolution of dorsal patterns in the *difficilis* complex are presented in Fig. 11, in which we show only how certain patterns may have been derived from others. We have relied largely on pattern in constructing our dendrogram (Fig. 10), particularly for apomorphous features. Scale and other external structural features, while useful in defining taxa, have been of little use in assessing evolutionary sequences. It is obvious that, for example, scale size has evolved repeatedly in different directions (that is, reversals have occurred); likewise such characters as postnasals or internasal number could easily have undergone reversals. In the complex and variable color patterns it is easy to see trends, although not always easy to identify derived features. With some pattern elements homology is patent, in others it is far from certain. For evolutionary analysis we have used pattern features even though they may not characterize a majority of a population; they serve as an indicator that the population made a certain evolutionary step.

Our reason for postulating that something like the *difficilis* lineate pattern with scapular patch and ocelli is primitive is that patterns of this sort are widespread in the complex (and beyond), occurring in members of the Puerto Rico bank and Cuban radiations. Our belief that the Cuban (*notatus* group) and Puerto Rican (*macrolepis* group) sphaerodactyls are derived from the Hispaniolan *difficilis* radiation is based upon the observation that there is not a great amount of diversification in either area (Puerto Rico bank and greater Cuban-Bahamian area), which implies recency of entry into both areas. Of course an area-limitation on diversity must affect Puerto Rico. Rough equivalence of evolutionary rates is an unsubstantiated premise. We will not be apodictic that our dendrogram necessarily be rooted in Puerto Rico but offer it as a reasonable suggestion subject to further evidence. It is principally the left side of the diagram in which we have the greatest confidence. The right side of the diagram is based mostly on minor changes in plesiomorphous characters of pattern; for this reason we have less confidence in it.

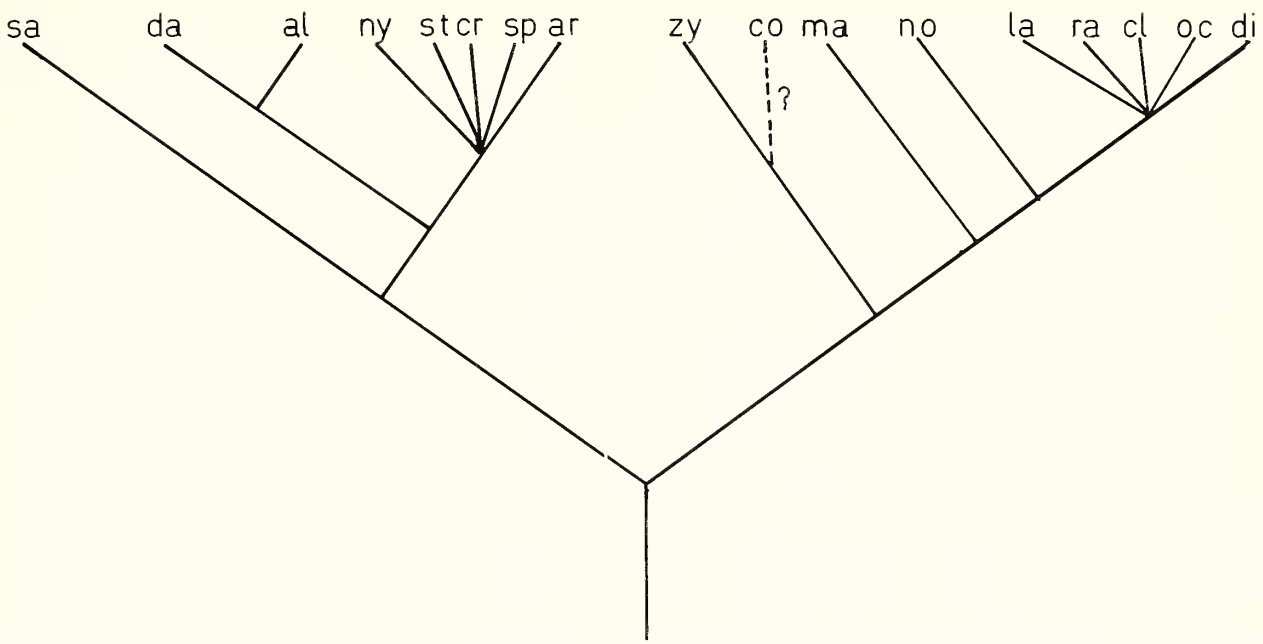

Fig. 10.—Dendrogram of evolutionary relationships of *difficilis* complex *Sphaerodactylus*—sa, *savagei*; da, *darlingtoni*; al, *altavelensis*; ny, *nycteropus*; st, *streptophorus*; cr, *cryphius*; sp, undescribed species (sp. 1); ar, *armstrongi*; zy, *zygaena*; co, *cochranae*; ma, *macrolepis* group; no, *notatus* group; la, *lazelli*; ra, *randi*; cl, *clenchi*; oc, *ocoae*; di, *difficilis*.

The taxa *armstrongi, streptophorus, nycteropus, cryphius,* and *omoglaux* seem to be the result of relatively recent allopatric differentiation and so retain allopatric or parapatric distributions with only limited or as yet questionable sympatry. This grouping of taxa, including the subspecies of *armstrongi* and *streptophorus* is polythetic with respect to a pool of characters. We have not been successful in analyzing their relationships beyond the polychotomy illustrated; forcing the characters into a dichotomous representation may be unrealistic.

The following is a list of the apomorphous characters used in constructing the dendrogram along with the species possessing each.

A. Anterior cephalic figure
   - A1. Simple, bilobed: *savagei, altavelensis, darlingtoni, cryphius, streptophorus, nycteropus,* sp. 1
   - A2. Bilobed, laterally indented: *streptophorus, nycteropus*

B. Occipitonuchal mark
   - B1. V-shaped: *armstrongi*
   - B2. M-shaped (with postauricular stripe): *armstrongi, streptophorus, cryphius,* sp. 1

C. Posterior cephalic figure (probable homologue of occipitonuchal mark): *savagei, altavelensis, darlingtoni,* sp. 1.

D. Mid-nuchal marks
   - D1. Ocelli or paired dashes: *streptophorus, cryphius,* sp. 1
   - D2. Collar: *streptophorus*

E. Border of scapular figure
   - E1. Large (not in contact with patch): *altavelensis, darlingtoni*
   - E2. Bipartite: *altavelensis, darlingtoni, armstrongi* (?)

F. Small ear size: *streptophorus, cryphius, nycteropus,* sp. 1

Ecological Notes on the *Difficilis* Complex

Sphaerodactylus altavelensis enriquilloensis is an inhabitant primarily of xeric habitats, ranging from wooded situations to thorn scrub and palm savannah, where it frequents terrestrial microhabitats—leaf-litter, trash, and rocks. The more mesic situations in which it has been collected occur in the eastern Valle de Neiba, where it was taken in banana groves, but in this case the mesicity was artificial (irrigation). The immediate situations in which we have often taken this form are relatively mesic oases within otherwise inhospitable xeric scrub. In the Barahona region *enriquilloensis* occurs in somewhat intermediate situations that tend towards the xeric.

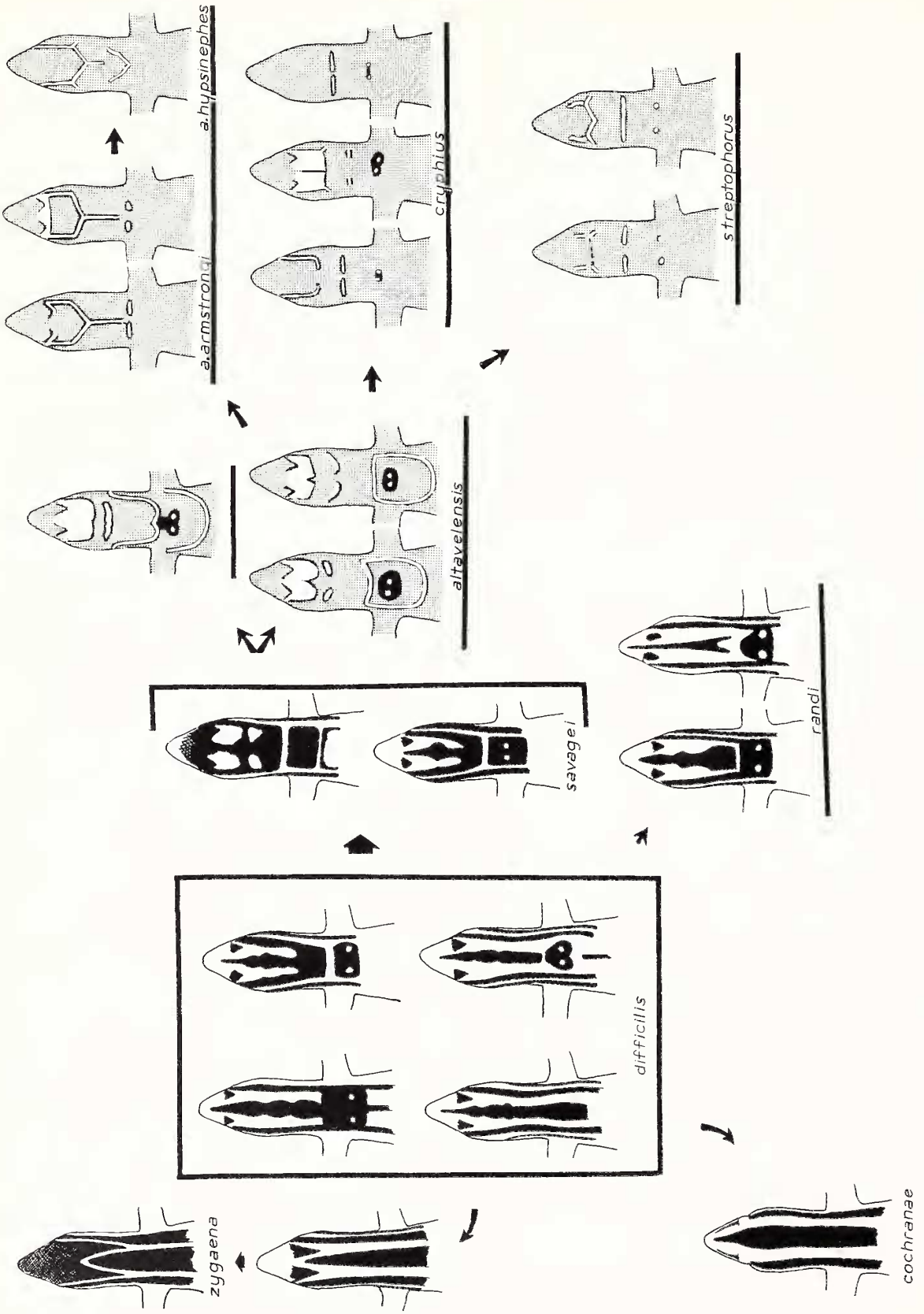

Fig. 11.—Hypothetical sequence of dorsal pattern evolution in the *Sphaerodactylus difficilis* complex.

The specimen tentatively referred to this subspecies from 7 km NW Vallejuelo was taken in dense semixeric woods. It is sympatric with *S. difficilis* in the eastern portion of its range and has been taken syntopically with *difficilis* at localities east of Azua and in the vicinity of Barahona. Also in the Barahona region it has been taken with *S. armstrongi* at one locality (3 mi S Barahona, a garbage dump). Although both species have been taken extensively in the Barahona region, they are seldom found at the same locality. In some instances long series of either species were taken without the other being found. To the collector, their microhabitats are similar, both being inhabitants of ground litter and trash or rocky situations. In the western Valle de Neiba *S. a. enriquilloensis* was collected at the same locality with *S. cryphius* but only at localities 6.7–7.0 km NW Duvergé. At the other localities for *cryphius* in the foothills of the Sierra de Baoruco, no specimens of *altavelensis* were taken, although the habitat appears ideal. In this region *S. rhabdotus* is known from a single locality and might eventually be found to be syntopic with *altavelensis.*

S. a. brevirostratus inhabits much the same kinds of situations as does *enriquilloensis* over most of its known range but appears to occur in some naturally more mesic situations. At 2.2 km SW Lascahobas two specimens were taken in banana and coffee growing areas, and the region is generally mesic. There is also a record from Furcy, a high elevation locality. It is at least broadly sympatric and no doubt syntopic with *S. elegans* (see Graham and Schwartz, 1978) over much of its range, although *elegans* probably has different microhabitat preferences. It is also sympatric with *S. cinereus* in the Cul de Sac Plain, with *S. copei* on the south side of the Cul de Sac (the two were collected together in rocks and trash in a cave at Diquini) and around Jacmel and at Jérémie, and possibly with *S. armstrongi hypsinephes* on the northern slopes of the La Selle. It also occurs macrosympatrically with *S. streptophorus* in the area between Trouin and Cayes Jacmel, but the two have not been taken at the same locality. If *S. altavelensis brevirostratus* is wide-ranging on the Tiburon Peninsula, it may be sympatric with several other species of sphaerodactyls, including *S. zygaena, S. elasmorhynchus,* and *S. nycteropus.*

The major part of the distribution of *S. darlingtoni* is in the wettest part of the island, the northeastern corner. There it is most often encountered in the gloomy pseudoforest of moist *cacaotales* and *cafetales,* where it inhabits leaf litter and piles of cacao husks, rotten logs, rocks, and piles of palm trash. The only recently collected specimens of *S. d. darlingtoni* were taken under rocks, palm trash, and logs in a mixed coffee-and-cacao planting in well-developed deciduous montane forest (1,400 ft). The holotype and paratype were taken at 4,000 ft on Pico Diego de Ocampo. North of Cruce de Guayacanes, it seemed to be primarily a rock-rubble inhabitant. Specimens of *S. d. noblei* were found active in leaf litter at 1600 hrs in a *cafetal-cacaotal* 6.4 mi SE Tenares at 700 ft. Two places where *S. d. noblei* was encountered in natural situations were in the forested region at Guaigüí, where the geckos were found under rocks and in rock rubble on a densely shaded forested hillslope of a ravine and under a rock on the floor of high-canopied forest, and within the forested edge of the *haitises* at 10 km NE Gonzalo, where specimens were taken under limestone rocks.

The holotype of *S. d. mekistus* was taken under a rock along a roadcut through montane rainforest at 2,800 ft. The holotype and paratypes of *S. d. bobilini* were taken in deciduous montane forest at elevations of 2,000 to 2,800 ft, under rocks and in leaf litter. The range of *S. d. bobilini* is essentially insular, as the surrounding lowlands are xeric scrub, certainly inhospitable to this form.

S. armstrongi is primarily an inhabitant of mesic situations, because much of its range is in the uplands, although much of the range of the nominate subspecies at low elevations tends towards the xeric. The high elevations records include, in addition to the type-locality, which we have not knowingly seen, a coffee grove at 3,600 ft (10.1 km S Cabral). Our supposition that *S. a. hypsinephes* would be a forest dweller has not entirely been borne out. Certainly it does inhabit forested situations, whence came most of the Dominican specimens (a forested ravine at about 1,400 ft; palm and deciduous forest at about 4,000 ft in a pile of thatching material), broadleaf rainforest at 5,800 ft, and in pinewoods at 5,600 ft. Our first Haitian specimen came from a coffee grove at 4,400 ft, but much of the subsequent long series from the same area (Seguin) came from open fields, where Haitians took them from little cairns of limestone that had been stacked to provide access to the soil for planting corn and other crops. It is still possible that it is a sciophile that can exist in open situations only when something other than vegetation (rocks) provides sufficient shade. One specimen from Boutillier road came from beneath rocks (but

many rocks) in an open situation not far different from the Seguin situation; the others came from small patches of shade (*Clusia rosea, Mammea americana*). Along Boutillier Road (=5 km W Pétionville), it occurs syntopically with *S. copei* and *S. altavelensis.*

Sphaerodactylus cryphius is a xerophile, known from the southern edge of the Valle de Neiba and the northern foothills of the Sierra de Baoruco. At localities NW of Duvergé it was taken in a shaded oasis surrounded by very xeric habitat and syntopically with *S. altavelensis.* At the type-locality (13 km NW Puerto Escondido) it was taken in piles of thatch-palm fronds in xeric scrub with the type-series of *S. rhabdotus*; it was also taken not far away in xeric cactus-acacia scrub. It would not be unreasonable to expect *S. copei* in this region, but it has not been taken there yet.

Sphaerodactylus omoglaux (Thomas, 1982) is presumably a xerophile, because it is known only from the eastern Cul de Sac Plain of Haiti, although most specimens have been taken in a shaded oasis near Fond Parisien, Haiti.

Sphaerodactylus streptophorus streptophorus is known primarily from xeric situations of the Barahona lowlands, although it occurs at mesic intermediate elevations of the Baoruco and La Selle mountains. It is syntopic with *S. difficilis* and *S. randi* (Schwartz, 1977), probably with *S. thompsoni,* and possibly with *S. copei,* although the latter species has not yet been taken within the range of *S. s. streptophorus.*

S. streptophorus sphenophanes has been found mostly in mesic situations (coffee groves, banana-breadfruit forests, etc.) but also in somewhat xeric areas, although not extreme ones.

Sphaerodactylus nycteropus seems confined to the xeric woods of the Morne Dubois Peninsula; it was not found in the extremely cut-over xeric coastal region southeast of Aquin, where *S. copei* was abundant. It occurs syntopically with *S. copei* at the type-locality.

Sphaerodactylus ocoae was collected in mesic but non-natural situations (*Cocos* groves) at 153 to 214 m (504–706 ft) in the Sierra de Ocoa.

Sphaerodactylus zygaena has been taken near the ocean (Dame Marie) and in a mesic *Musa* grove (Les Anglais).

The sphaerodactyls of this complex seem to fit into four broad climatic habitat types: (1) Steno-xerophiles, species that are pretty much confined to extreme (or distinctly) xeric situations (even though they may at times be found within artificial or natural "oases" within such situations). (2) Eury-xerophiles, species that inhabit either (a) semi-xeric (but more towards the xeric) situations *or* (b) both xeric and intermediate or mesic situations (but with the greater part of their range in the xeric). (3) Eury-mesophiles, species that inhabit (a) mesic but open situations (for example, savannahlike), (b) both mesic and open situations (but more of the range is mesic), or (c) mesic and xeric (but more of the range is mesic). (4) Steno-mesophiles, those species that are confined largely to moist areas. Ranges of steno-xerophiles will generally not extend upgradient from the 750 mm (30 inch) isohyet, and steno-mesophiles generally fall within (upgradient of) the 1,750 mm (69 inch) isohyet (See Santiago de la Fuente, 1976: 165 for a rainfall map of the Dominican Republic). Between these limits fall most of the habitats of Hispaniola, the eury-xerophiles inhabiting the parts more towards the xeric, and the eury-mesophiles inhabiting those parts more towards the mesic (or combinations of more extreme habitats as noted above). Very generally, eury-xerophytic conditions prevail in western Hispaniola and eury-mesophytic conditions in eastern Hispaniola. It should be added that some taxa are difficult to place with exactitude in the two middle categories (eury-xerophiles and eury-mesophiles), since the ranges may be incompletely known or the amount of the range in different habitats may be nearly equal.

Geographic Relationships of the Species

The species *armstrongi, cryphius, streptophorus, nycteropus, omoglaux,* and *zygaena* are south island species in the sense of Schwartz (1980), whereas *altavelensis* and *difficilis* were categorized (Schwartz, 1980) as south island invaders from the north island; *darlingtoni, clenchi,* and *savagei* are wholly north island species, as presumably is *lazelli.* Although *altavelensis* appears now to be restricted on the south island and thus to have the appearance of a recent invader, its distribution there also appears relictual (its occurrence on Alto Velo but not the Barahona Entrapment and its apparently isolated occurrence near Jérémie at the end of the Tiburon Peninsula). The species *altavelensis* and *darlingtoni* are a pair that would conform to the north island/south island dichotomy, if it be assumed that *altavelensis* has secondarily invaded the north island along xeric corridors into northwestern Haiti and into the Valle de

San Juan of the República Dominicana. Although *altavelensis* has been found in mesic situations, it is principally a species of xeric or semi-xeric habitats.

The following summarizes the geographic and habitat categorizations for the *difficilis* complex sphaerodactyls (NI = north island; SI = south island). Omitted from consideration are *S. lazelli* and an undescribed species from Ça Soleil in Haiti (Thomas and Schwartz, MS).

Steno-xerophiles:
- *S. streptophorus streptophorus* (SI)
- *S. cryphius* (SI)
- *S. nycteropus* (SI)
- *S. omoglaux* (SI)
- *S. altavelensis altavelensis* (SI)
- *S. altavelensis enriquilloensis* (NI?)

Eury-xerophiles:
- *S. altavelensis brevirostratus* (NI?)
- *S. altavelensis lucioi* (NI)
- *S. ocoae* (NI)

Eury-mesophiles:
- *S. difficilis* (NI)
- *S. savagei* (NI)
- *S. zygaena* (SI)
- *S. streptophorus sphenophanes* (SI)

Steno-mesophiles:
- *S. clenchi* (NI)
- *S. darlingtoni* (NI)
- *S. armstrongi* (SI)

Relationships with other *Sphaerodactylus*

Shreve (1968) used the term "*notatus* group" to include the then-known Hispaniolan members of the *difficilis* complex (as well as *S. samanensis,* which we exclude from the group). By such an action (and by uses of trinomina—under *S. notatus*—for several of the forms included therein) he correctly indicated that there exists a large group of geckos in the Antilles and on the extreme southeastern portion of the North American continent that are allied to each other. These are, with their respective ranges and including species described since Shreves paper: *S. notatus* (Cuba, Bahamas, southern Florida, Swan Islands); *S. bromeliarum* (Cuba); *S. inaguae* (Great and Little Inagua islands); *S. underwoodi* (Turks Islands); *S. macrolepis* (Puerto Rico, Virgin Islands, northern Lesser Antilles south to St. Barthelemy); *S. roosevelti* (Puerto Rico); *S. nicholsi* (Puerto Rico); *S. parthenopion* (Virgin Islands); *S. beattyi* (St. Croix); *S. monensis* (Isla Mona); *S. micropithecus* (Isla Monito); and *S. levinsi* (Isla Desecheo). Inspection of this list shows that Puerto Rico (including the Virgin Islands, Mona, and Desecheo) and Hispaniola account for 25 of the 29 species that we associate in this group. It seems reasonable to assume that Hispaniola has been the center of evolution of the *notatus* group (15 species) with "Puerto Rico" a secondary center (10 species). From this center, there has been very limited "spillage" into adjacent areas and islands; *S. inaguae* and *S. underwoodi* occur in very circumscribed insular areas in the southern Bahamas. Of them, *S. underwoodi* most closely resembles *S. difficilis,* whereas *S. inaguae* seems most closely related to *S. notatus.* Of the extra-Hispaniolan-Puerto Rican species, surely *S. notatus* has been the most successful, because it is not only island-wide in Cuba and the Isla de la Juventud and the Archipiélago de los Canarreos, but it has also successfully invaded both the Great and Little Bahama banks, where it is also widely distributed, the southern Florida mainland and the Florida Keys, and the Swan Islands.

To combine *difficilis, notatus,* and *macrolepis* all under one name (*notatus,* which has priority) obscures the quite distinctive pattern features and the variation in each of these species. Such a nomenclatural union also results in a single species which ranges from the Little Bahama Bank and continental North America in the north, south throughout Cuba, Isla de la Juventud, the Swan Islands, Hispaniola, Puerto Rico, and the northern Lesser Antilles. Such an agglomeration is to us unsatisfactory. On each of the geographic areas concerned (the Bahamas and Cuba, Hispaniola, and the Puerto Rico Bank) there has been a radiation of geckos in this assemblage; these radiations constitute natural groupings. The criterion of intergradation versus reproductive isolation is not applicable. It is our judgement that the interests of a more manageable taxonomy are served by according specific rank to *S. notatus, S. difficilis,* and *S. macrolepis.*

We would not be completely averse, on the other hand, to consider *S. inaguae* conspecific with *S. notatus* and *S. underwoodi* with *S. difficilis.* Differences in each case are not particularly trenchant; nevertheless, there *are* differences and these do reflect (in the cases of these two southern Bahamian species) divergences from basic stocks which may well be long-standing (see Schwartz, 1968, for a discussion of the southern Bahamian herpetofauna),

perhaps equal in time to several of the Hispaniolan species which seem to have diverged to a greater extent than have either *inaguae* or *underwoodi* from their original stocks. Anyone who examines specimens of *inaguae* and *underwoodi* cannot fail to note their similarities with (and also differences from) *S. notatus* and *S. difficilis*. If these similarities demand nomenclatural recognition, then "*S. n. inaguae*" and "*S. d. underwoodi*" may be used with propriety. We, on the other hand, prefer to emphasize the differences between the satellite taxa and their basal stocks and to take into consideration the apparent history of the *notatus* group in the southern Bahamas; therefore our course is to consider *S. inaguae* and *S. underwoodi* as species distinct from their relatives elsewhere in the Antilles.

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